3.8 AIR QUALITY

SYNOPSIS

This section describes the regulatory framework pertaining to air quality and gives an overview of current air quality conditions, as well as evaluates potential impacts to air quality from the proposed action and alternatives. The section details what emissions and pollutants are subject to regulation, including greenhouse gases and hazardous air pollutants, among which mercury (Hg) is of particular concern. Air quality effects are then analyzed by project phase for each alternative, looking at intensity, duration, geographic extent, and context of expected effects. Particular attention is given to permit thresholds and to ambient air quality, which is an indicator for health effects. The analysis is organized by project component (mine site, transportation facilities, and pipeline).

Summary of Existing Conditions:

<u>Types of pollutants</u>: *Criteria pollutants* are air constituents which are harmful in concentrations above a certain threshold; for instance, dust. *Hazardous air pollutants* (HAPs) are toxic substances not ordinarily present in the atmosphere in most places (or only in trace amounts); such as mercury. *Greenhouse gases* (GHGs) are not necessarily toxic in and of themselves, but may contribute to global warming; carbon dioxide (CO_2) is the most prevalent GHG, and the gas by which other GHGs are frequently measured.

<u>Regulations</u>: The Clean Air Act (CAA) governs air pollution in the U.S., and under this act, the U.S. Environmental Protection Agency (EPA) regulates and sets standards for ambient air quality and for emissions of pollutants. The State of Alaska implements many CAA regulations within Alaska, and also sets its own standards for air quality.

Both federal and state Ambient Air Quality Standards (AAQS) take into account dispersion of pollutants, meaning the farther away from the point of origin a pollutant travels, it will become less concentrated.

At the same time, exposure to airborne toxins can be cumulative, and many hazardous substances are carried far from their point of origin before depositing. The EPA addresses issues of deposition and accumulation through programs that monitor sources of exposure to toxins through National Emission Standards for Hazardous Air Pollutants (NESHAPs) and Maximum Achievable Control Technology (MACT) requirements, followed by addressing residual risk. This approach, adopted in 1990, requires existing sources to meet emissions limits based on levels already being achieved by the lowest-polluting 12 percent of similar sources within the same industry, and new sources to meet emissions of the best-controlled existing comparable source (42 United States Code (USC) 7401, *et seq* Section 112(d)).

Representative Air Pollutants: The section covers relevant air pollutants in detail; three representative pollutants are presented here for purposes of illustration.

Mercury is a naturally-occurring, highly toxic metal often found in gold-containing rock, as is the case in the proposed Project Area. Mercury abatement and containment methods have been a subject of study and improvement in gold processing in recent decades. In the air, the most common form of gaseous mercury can travel long distances before depositing.

Oxides of nitrogen (NO_x) consist of nitrogen dioxide (NO_2), nitric oxide (NO), and nitrous oxide (N_2O) and are produced by the reaction of gaseous nitrogen and oxygen during combustion. They contribute to acid rain, and to the formation of ozone (O_3) in the troposphere (lower atmosphere), which can be harmful to human and animal health. Nitrous oxide is considered to be a greenhouse gas.

Greenhouse gases contribute to global warming; and climate disruption. A number of substances potentially released by project components act as GHGs, including CO_2, N_2O, and methane (CH_4). GHGs are frequently expressed in terms of equivalence to CO_2, noted CO_2-e, or CO_2 equivalents. For example, '3 tons CO_2-e' indicates the same atmospheric global-warming potential as 3 tons of CO_2.

Expected Effects:

Alternative 2: Donlin Gold's Proposed Action – For purposes of comparing air effects of components and phases of the proposed project, Synopsis Table 1, below, summarizes projected emissions of selected pollutants. No emissions are expected to cause an exceedance of any air quality standard.

Synopsis Table 1: Summary of Selected Emissions by Phase and Component[1]

Component/Phase	$PM_{2.5}$	PM_{10}	Total HAPs	Total GHGs[2]
Mine Site				
Construction[3]	117 tons	767 tons	4.6 tons	197,198 tons
Operations and Maintenance	518 tpy	1,630 tpy	25.6 tpy[4]	1,760,469 tpy
Closure	49 tpy	273 tpy	2.4 tpy	194,253 tpy
Transportation Facilities[5]				
Land, Air Transportation. – Construction[3]	161 tons	1,404 tons	7.7 tons	301,482 tons
River Transportation – Construction[3]	9 tpy	9 tpy	nc	10,574 tpy
Land, Air Transportation - Operations and Maintenance	5 tpy	40 tpy	1 tpy	59,027 tpy
River Transportation – Operations and Maintenance	14 tpy	15 tpy	nc	18,107 tpy

Synopsis Table 1: Summary of Selected Emissions by Phase and Component[1]

Component/Phase	$PM_{2.5}$	PM_{10}	Total HAPs	Total GHGs[2]
Pipeline[5]				
Construction[3]	71 tpy	518 tpy	11.3 tpy	258,746 tpy
Operations and Maintenance	0 tpy	0 tpy	0.01 tpy	10,036 tpy

Notes:
1 Emissions shown in this table consist of fugitive, mobile and stationary source emissions.
2 GHGs are expressed in CO_2 equivalents.
3 For the mine site and transportation facilities, this table shows total emissions for the duration of the construction phase (3 to 4 years), not an annual rate as shown for operations and closure. The emissions vary per year so not appropriate to divide by number of years.
4 Stationary source HAP emissions are less than 25 tpy.
5 No values are provided to the closure and reclamation phase for the transportation facilities and pipeline components, because emissions would be negligible for this phase.
nc = not calculated (negligible because HAPs are a subset of Volatile Organic Compounds (VOC) and VOC emissions negligible)
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively
HAPs = Hazardous air pollutants
GHGs = Greenhouse gases
tpy = tons per year

Mine Site: Air quality modeling for the mine site was performed using a conservative, worst-case fuel scenario. For the mine site, the operations and maintenance phase would trigger air-quality permits and GHG reporting. The mine site would be subject to Prevention of Significant Deterioration (PSD) review for carbon monoxide (CO), NO_x, $PM_{2.5}$, PM_{10}, and volatile organic compounds (VOCs). Dispersion modeling of affected pollutants with regard to PSD increments and ambient air quality standards is shown in Table 3.8-21 and Table 3.8-22, respectively. All impacts subject to PSD review remain below 100 percent of allowable increment (the highest being 24-hr high of $PM_{2.5}$, at 62.2 percent). Similarly, impacts remain below 100 percent of the AAQS (the highest being 1-hour high of NO_2, at 61.8 percent, with the next-highest being 24-hour high for $PM_{2.5}$, at 30.6 percent. Ambient Hg modeling (Table 3.8-23), shows expected exposure at the mine site of less than 1 percent of the most stringent standard for annual exposure with no observable adverse effect (0.2 $\mu g/m^3$).

Mitigation measures and required best practices – such as use of Hg abatement measures resulting in capture of 99.6 percent of Hg from the processing facility[1] and dust suppression quelling approximately 90 percent of dust generated from unpaved roads, as well as additional best practical methods to suppress dust from other dust generating sources within the mine site – are key. Air quality effects associated with construction and closure are both considered temporary, while those associated with operations and maintenance would be long-term. Neither construction nor closure would create conditions above permitting thresholds or cause impacts above ambient standards, so are considered low intensity.

[1] The removal efficiency cited applies only to the process facility. Mercury emissions from point sources at the process facility are controlled to the extent that 99.6 percent of the mercury is captured (Hatch 2014). The resulting amount released to the air from the stacks at the process facility is estimated at 128 pounds per year. Note that mercury may also be releases to the air or water from the open pit, waste rock facility, or tailings storage facility (SRK 2014a).

Operations of the mine site would meet ambient air standards, a low intensity impact.[2] Understanding that in the U.S., long-range airborne transport of toxins is addressed through MACT standards the air quality impacts are considered to be localized.

Transportation Facilities and Pipeline: No permit or reporting threshold for air quality would be exceeded in any project phase for these components. All effects are considered to be localized, and AAQS would not be exceeded. Therefore, the air quality effects are considered to be minor.

Taken all together, the effects of Alternative 2 on air quality would be minor.

Other Alternatives: Air quality impacts for Alternatives 3 through 6 are discussed in Sections 3.8.3.4 through 3.8.3.8. The effects of other alternatives on air quality would be similar to those of Alternative 2. Differences of note include:

- *Alternative 3A (LNG-Powered Haul Trucks)* would reduce the use of diesel fuel and increase consumption of natural gas, creating minor reductions in emissions of CO, NO_x, particulate matter (PM), SO_2, VOCs, and GHGs at the mine site, and reduced mobile source emissions from barging compared to Alternative 2. The overall impact would be similar to Alternative 2.
- *Alternative 3B (Diesel Pipeline)* would result in dual-fuel equipment at the mine site being run on diesel, the basis for the worst-case numbers modeled for Alternative 2. In practice, Alternative 2 emissions would be less than those modeled, while Alternative 3B emissions would be at modeled levels, meaning there would be increased CO, NO_x, SO_2, VOCs, and PM at the mine site compared to execution of Alternative 2. There would be reduced mobile source emissions from barging compared to Alternative 2. The overall impact would be similar to Alternative 2.
- *Alternative 5A (Dry Stack Tailings)* would require a filter plant to dewater tailings and produce filter cake during operations. The tailings would be transported by truck to the Anaconda Creek valley for dry stacking. This alternative would call for increased power generation, resulting in an increase in emissions from the power plant. It would require a 6 percent increase in barge traffic, and would create more fugitive dust than Alternative 2. At closure, the storage facility would be covered and flattened. None of these changes affect the overall magnitude of air quality impacts, which would be low, similar to Alternative 2.

[2] PSD, Title V, and minor NSR permit thresholds are shown in Table 3.8-19.

3.8.1 APPLICABLE REGULATIONS

3.8.1.1 REGULATORY FRAMEWORK

The basic federal statute governing air pollution in the U.S. is the 1970 CAA,[3] as amended in 1977 and 1990. The CAA amendments of 1977 created New Source Review (NSR), a preconstruction review program for new or modified stationary sources. The NSR program includes the PSD program for protecting "clean" air, and the Nonattainment NSR (NNSR) program for cleaning up "dirty" air (an area that does not meet the NAAQS is known as a "nonattainment area"). The PSD provisions of the 1977 CAA amendments include provisions for protecting air quality in national parks and wilderness areas, and set a specific goal of preventing impairment of visibility in certain national parks and wilderness areas for which visibility impairments are a result of manmade air pollution. These provisions required states to update their State Implementation Plans (SIPs) to include reasonable further progress plans and to take other measures necessary to reduce visibility impairment.

In 1990, the CAA was again amended to require states to develop and implement an operating permit program for stationary sources, and to require EPA to: take action on visibility impairment from multiple sources of regional haze; develop MACT standards for area sources of HAPs; and develop requirements for preventing catastrophic releases of HAPs. The 1990 amendments also included transportation and general conformity requirements aimed at ensuring that new federal transportation projects or other projects involving federal monies, approval, or permitting conform to air quality plans of nonattainment and/or maintenance areas.

3.8.1.1.1 AMBIENT AIR QUALITY STANDARDS

Ambient air quality standards are set by federal regulations, which here are implemented by the State of Alaska. The EPA, in 40 Code of Federal Regulations (CFR) Part 50, establishes NAAQS for six principal pollutants, which are called "criteria" pollutants: PM, SO_2, CO, NO_2[4], O_3, and Pb. Under these regulations, PM with an aerodynamic diameter less than or equal to 10 micrometers is PM_{10}, and less than or equal to 2.5 micrometers is $PM_{2.5}$. The NAAQS were developed to protect public health (primary standards) and public welfare (secondary standards).

While the EPA sets the NAAQS, states are responsible for attaining and maintaining the standards. The Alaska Department of Environmental Conservation (ADEC) is the implementing agency for air pollution control regulations for the State of Alaska. ADEC has adopted Alaska Ambient Air Quality Standards (AAAQS) that are generally the same[5] as the primary NAAQS for all six criteria pollutants; legally, AAAQS cannot be less stringent. ADEC also established AAAQS for ammonia (NH_3) and reduced sulfur compounds, for which there is no NAAQS. In

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[3] The CAA is codified in 42 United States Code 7401, *et seq*.

[4] NO_2 is a component of nitrogen oxide gases formed during the combustion of coal and fuels, collectively referred to as NO_x. NO_x is initially composed predominantly of nitric oxide (NO) (90-95 percent) and a lesser amount (5-10 percent) of NO_2, but NO oxidizes to NO_2 in the atmosphere. NO_2 causes detrimental effects to the bronchial system, and along with particulate matter, is the main cause of smog in urban areas.

[5] At the time of DEIS printing, exceptions include newer NAAQS that ADEC has not yet adopted (i.e. the 12 $\mu g/m^3$ Annual $PM_{2.5}$ NAAQS).

addition, the AAAQS include additional averaging times for some criteria pollutants (e.g., SO_2). Table 3.8-1 lists the primary and secondary NAAQS, alongside the AAAQS.

Table 3.8-1: National and Alaska Ambient Air Quality Standards

Pollutant	Averaging Time	Primary NAAQS	Secondary NAAQS	AAAQS	Form
PM_{10}	24-hour	150 µg/m^3	150 µg/m^3	150 µg/m^3	NAAQS: Not to be exceeded more than once per year on average over 3 years AAAQS: Not to be exceeded by the 24-hour average concentration more than one day per calendar year
$PM_{2.5}$	Annual	12 µg/m^3	15 µg/m^3	15 µg/m^3	NAAQS: Annual mean, averaged over 3 years AAAQS: Annual arithmetic mean, averaged over 3 years, rounded to the nearest 0.1 µg/m^3
	24-hour	35 µg/m^3	35 µg/m^3	35 µg/m^3	NAAQS: 98th percentile, averaged over 3 years AAAQS: 98^{th} percentile, averaged over 3 years, rounded to the nearest 1 µg/m^3
SO_2	Annual	NA	NA	80 µg/m^3 (0.030 ppm)	Annual arithmetic mean
	24-hour	NA	NA	365 µg/m^3 (0.14 ppm)	Not to be exceeded more than once per year
	3-hour	NA	0.5 ppm	1,300 µg/m^3 (0.50 ppm)	Not to be exceeded more than once per year
	1-hour	75 ppb	NA	196 µg/m^3 (75 ppb)	99^{th} percentile of 1-hour daily maximum concentration, averaged over 3 years
CO	8-hour	9 ppm	NA	10,000 µg/m^3 (9 ppm)	Not to be exceeded more than once per year
	1-hour	35 ppm	NA	40,000 µg/m^3 (35 ppm)	
NO_2	Annual	53 ppb (0.053 ppm)	53 ppb (0.053 ppm)	100 µg/m^3 (0.053 ppm)	NAAQS: Annual mean AAAQS: Not to be exceeded by the average of the 1-hour concentration in a calendar year
	1-hour	100 ppb (0.100 ppm)	NA	188 µg/m^3 (0.100 ppm)	98^{th} percentile of 1-hour daily maximum concentration, averaged over 3 years
O_3	8-hour	0.075 ppm (147 µg/m^3)	0.075 ppm (147 µg/m^3)	0.075 ppm (147 µg/m^3)	Annual 4^{th} highest daily maximum 8-hour concentration, averaged over 3 years

Table 3.8-1: National and Alaska Ambient Air Quality Standards

Pollutant	Averaging Time	Primary NAAQS	Secondary NAAQS	AAAQS	Form
Pb	3-month rolling	0.15 μg/m^3	0.15 μg/m^3	0.15 μg/m^3	NAAQS: Not to be exceeded AAAQS: Not to be exceeded by the maximum 3-month arithmetic mean for a 3-year period
Reduced Sulfur, expressed as SO_2	30-minute Average	NA	NA	50 μg/m^3	Not to be exceeded more than once per year
NH_3	8-hour Rolling Average	NA	NA	2,100 μg/m^3	Not to be exceeded more than once per year

Notes:
AAAQS = Alaska Ambient Air Quality Standard
CO = Carbon monoxide
NA = Not applicable
NAAQS = National Ambient Air Quality Standard
NH_3 = Ammonia
NO_2 = Nitrogen dioxide
O_3 = Ozone
Pb = Lead
ppm = Parts per million
ppb = Parts per billion
SO_2 = Sulfur dioxide
μg/m^3 = Micrograms per cubic meter
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively

Source: EPA 2013a; ADEC 2015a.

PM emissions can be directly emitted into the air or can be created in the atmosphere through chemical or physical reactions between gases. This is known as secondary PM.

In addition to the criteria pollutants described above, non-criteria pollutants can be detrimental to the environment. Reduced sulfur compounds and NH_3 are non-criteria pollutants, as well as air toxics, including mercury.

3.8.1.2 AIR QUALITY ATTAINMENT STATUS

The EPA determines air quality attainment status based on whether the air quality in the area meets (attains) the NAAQS. Table 3.8-2 summarizes terms used to describe the air quality attainment status of an area.

Table 3.8-2: Air Quality Attainment Status Terminology

Term	Meaning
Nonattainment Area	Air quality measurements in the area violate primary NAAQS or AAAQS for one or more criteria pollutants (status is pollutant-specific).
Attainment Area	Air quality measurements in the area comply with primary NAAQS or AAAQS for one or more criteria pollutants (status is pollutant-specific).

Table 3.8-2: Air Quality Attainment Status Terminology

Term	Meaning
Unclassified/Attainment	If there is insufficient data on the air quality in the area to designate as attainment or nonattainment, area is considered "unclassified" and is treated as attainment area under the CAA.
Maintenance Area	Areas that were previously designated nonattainment and have since demonstrated compliance with a NAAQS are designated "maintenance" for 20 years after the effective date of attainment; this time period assumes that the area remains in compliance with the standard.

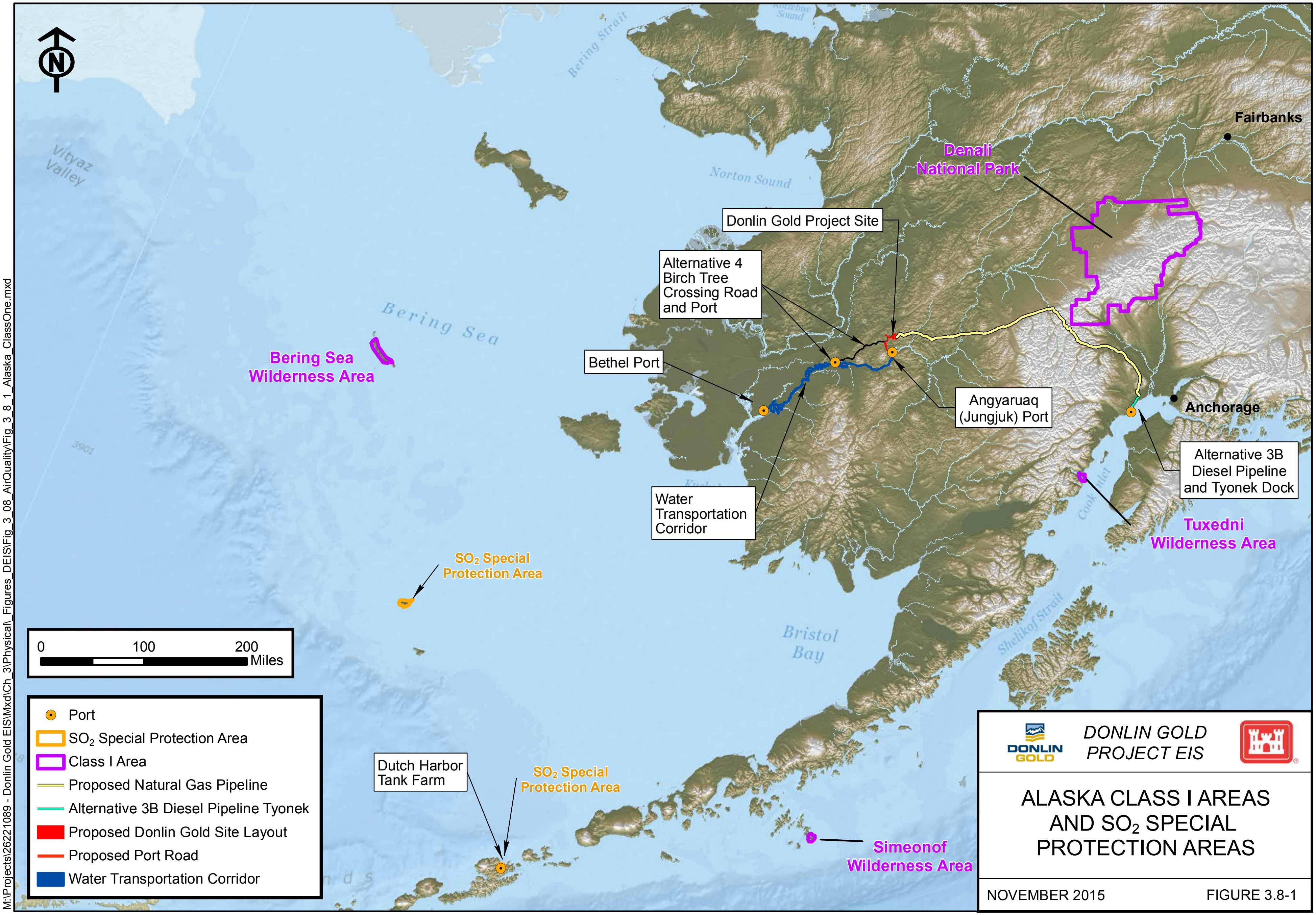
Attainment areas are classified as Class I (generally, national parks and wilderness areas above a certain size), Class II (areas not classified as Class I or III), or Class III (areas that states may designate for development) depending on the amount of air pollution. For each classification, the CAA specifies a maximum level (the "increment" in terms of micrograms per cubic meter [mg/m^3]) of SO_2, NO_2 and PM by which air quality can be degraded after a certain date. The levels, shown in Table 3.8-3 for Class II, are more stringent for Class I areas and less stringent for Class III areas. Regardless of Class I/II/III status, all areas must attain the NAAQS (shown in Table 3.8-1), or the delegated agency must develop a plan to attain the NAAQS.

Table 3.8-3: Maximum Allowable Increments for Class II Areas

Pollutant	Averaging Time	Maximum Allowable Increase (µg/m^3)
PM_{10}	Annual Arithmetic Mean	17
	24-hour Maximum	30
$PM_{2.5}$	Annual Arithmetic Mean	4
	24-hour Maximum	9
SO_2	Annual Arithmetic Mean	20
	24-hour Maximum	91
	3-hour Maximum	512
NO_2	Annual Arithmetic Mean	25

Notes:
µg/m^3 = Micrograms per cubic meter NO_2 = Nitrogen dioxide SO_2 = Sulfur dioxide
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively
Source: ADEC 2015a.

Designation of Class I areas are codified in 40 CFR Part 81, Subpart D. There are 156 Class I areas in the U.S. for which federal land managers have identified visibility as an important value. Four of these are in Alaska: Denali National Park, Tuxedni Wilderness Area, Simeonof Wilderness Area, and Bering Sea Wilderness Area. These Class I areas are shown on Figure 3.8-1. The remainder of Alaska is designated as Class II. There are no Class III areas in Alaska. The distance of the Class I areas from the project components is provided in Section 3.8.3.3.1, along with discussion of correspondence with the federal land manager.



DONLIN GOLD PROJECT EIS

ALASKA CLASS I AREAS AND SO_2 SPECIAL PROTECTION AREAS

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FIGURE 3.8-1

Alaska has one nonattainment area and four maintenance areas. The Fairbanks and North Pole urban area is designated as nonattainment for $PM_{2.5}$. The Eagle River area in the Municipality of Anchorage is designated as a maintenance area for PM_{10}, the Municipality of Anchorage and Fairbanks and North Pole urban areas are designated as maintenance areas for CO, and the Mendenhall Valley in the City and Borough of Juneau is designated as a maintenance area for PM_{10}. ADEC's SIP describes how the State of Alaska will comply with the CAA and achieve attainment with the NAAQS and/or AAAQS.

Relative to the four categories described in Table 3.8-2, the air quality attainment status for the proposed Donlin Gold Project Area is either "attainment" or "unclassifiable/attainment" for each of the six criteria pollutants. The proposed Project Area is classified as Class II. Maximum allowable increments for three of the six criteria pollutants (PM, SO_2, and NO_2) are presented in Table 3.8-3. Maximum allowable increases for Class II areas are not specified for criteria pollutants CO, O_3, or Pb (ADEC 2015a).

3.8.1.3 REGULATORY REQUIREMENTS

The following air quality control provisions implemented under the CAA would be applicable to the proposed Donlin Gold Project.

- Greenhouse gases
- NSR permits (Title I)
  - Major PSD permits
  - Minor NSR permits
- Visibility protection
  - Regional Haze Rule
- Operating permits (Title V)
- NSPS
- NESHAPs/MACT
- Compliance Assurance Monitoring (CAM)
- Mobile source regulations

The following air quality control provisions implemented under the CAA were reviewed and would not be applicable to the proposed Donlin Gold Project. Refer to Appendix I under "List of Regulations found to be Inapplicable to Project" for more information.

- Major NNSR permits
- Visibility and other special protection areas
- Best Available Retrofit Technology (BART)
- Conformity
- Chemical accident prevention provisions
- Open burning

3.8.1.3.1 GREENHOUSE GASES

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. EPA found that emissions of GHGs (i.e., CO_2, CH_4, N_2O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride [SF_6]), pose a threat to public health and welfare (EPA 2009a). Subsequent to this finding, EPA issued the Mandatory Reporting of Greenhouse Gas Rule. This rule, codified in 40 CFR Part 98, is the first comprehensive national system for reporting emissions of CO_2 and other GHGs produced by major sources in the U.S. The purpose of the rule is to collect comprehensive and accurate data about the production of GHGs in order to confront global warming.

The gases covered by the rule are CO_2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) and other fluorinated gases. Because CO_2 is the reference gas for climate change, measures of non-CO_2 GHGs are converted into CO_2-equivalent (CO_2-e)[6] based on their global warming potential (GWP) (potential to absorb heat in the atmosphere). GWPs for these covered gases are listed in Table 3.8-4.

Table 3.8-4: Global Warming Potentials

GHG	Global Warming Potential (100-Year Horizon)
CO_2	1
CH_4	25
N_2O	298
HFCs	From 12 to 14,800
PFCs	From 7,500 to 12,200
SF_6	22,800

Source: EPA 2013f.

The reporting requirements apply to suppliers of fossil fuel and industrial chemicals, manufacturers of certain motor vehicles and engines (not including light and medium duty on-road vehicles), and sources with emissions greater than 25,000 metric tons (MT) per year, in terms of CO_2-e GHGs (about the amount of GHG emissions emitted from 5,200 passenger vehicles over the course of a year).

Sources must report under the GHG rule if they are in a source category listed in 40 CFR 98.2(a)(1) or (a)(2) (including certain electricity generation units, cement production, or iron and steel production); or if the source:

- is not a source category listed in 40 CFR 98.2(a)(1) or (a)(2);
- has an aggregate maximum rated heat input capacity greater than 30 million British thermal units per hour (MMBtu/hr); and
- emits at least 25,000 MT per year of CO_2-e from all stationary fuel combustion sources.

[6] As defined in 40 CFR Part 98, CO_2-e means the number of metric tons of CO_2 emission with the same theoretical global warming potential as one metric ton of a non-CO_2 GHG; and global warming potential (GWP) means the ratio of the time-integrated radiative forcing from the instantaneous release of one kilogram of a trace substance relative to that one kilogram of a reference gas, i.e. CO_2 (EPA 2009b).

3.8.1.3.2 NEW SOURCE REVIEW PERMITTING

NSR is a preconstruction permitting program that ensures air quality is not significantly degraded when a new source of air pollution is constructed, or an existing source is modified, such that air pollutant emissions are increased. In areas with poor air quality (nonattainment areas), NSR ensures that the new emissions do not inhibit progress toward cleaner air. In areas with good air quality, NSR ensures that the new emissions do not degrade the air quality to a degree considered unacceptable (major PSD or minor NSR). In addition, the NSR program ensures that any large, new, or modified industrial source would be as clean as possible, by incorporating advances in air pollution controls.

NSR permits are legal documents that authorize a permittee to construct a source of emissions. The permits also specify how the permittee may operate the emissions source, including limitations on emissions and / or operating hours.

<u>Major Prevention of Significant Deterioration Permits</u>

Prevention of Significant Deterioration permits are required for PSD major stationary sources that are either new or are being significantly modified[7] in an attainment area.

The emissions thresholds triggering a PSD review and permitting are listed below.[8]

- For GHG emissions, a new source is subject to PSD review if it is otherwise subject to PSD (for another regulated pollutant) and has a potential to emit (PTE) greater than or equal to 75,000 tons per year (tpy) CO_2-e.
- For regulated air pollutants other than GHGs, a source is subject to PSD review if it emits more than 100 tpy (if classified in one of the 28 named source categories listed in Section 169 of the CAA) of the regulated air pollutant, or 250 tpy of the regulated air pollutant for any other type of source.
- For a source subject to PSD review for one regulated pollutant, the source is also subject to PSD review for all other pollutants causing a significant increase in emissions level.

Activities at the Donlin Gold Project are not listed in Section 169 of the CAA, so the PSD major threshold for NO_x, CO, SO_2, VOC, $PM_{2.5}$ and PM_{10} is 250 tpy. Issuance of PSD permits requires a control technology review, an air quality analysis to evaluate the project impact on ambient air quality standards and increments, and an additional impacts analysis to evaluate the impact of the project on soils, vegetation, and visibility. The control technology review requires determination of the Best Available Control Technology (BACT), which refers to an emission limit based on the best available controls. The determination considers cost, environmental impacts, and energy needs. The air quality analysis ensures the proposed project does not cause or contribute to a violation of ambient air quality standards or increments.

An additional impact analysis is an assessment of the project impacts on air, soil, vegetation, and visibility resources (also referred to as Air Quality Related Values or AQRVs) that are

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[7] A significant (major) increase for a PSD major modification is defined in 40 CFR 52.21. The most common pollutants that trigger PSD are: NO_x threshold 40 tpy, CO threshold 100 tpy, SO_2 threshold 40 tpy, PM_{10} threshold 15 tpy, $PM_{2.5}$ threshold 10 tpy, and O_3 precursor VOC threshold 40 tpy.

[8] This summary reflects July 24, 2014 EPA Guidance indicating that EPA will no longer treat GHGs as air pollutants for purposes of determining whether a source is a major source required to obtain a PSD or Title V permit (EPA 2014e). ADEC incorporates federal PSD rules into Alaska regulations in 18 AAC 50.306.

sensitive to air quality. These analyses will be reviewed by ADEC as part of the PSD permit as necessary. In addition, ADEC must notify the appropriate federal land manager (in this case, the National Park Service [NPS]) of a proposed PSD-major project that has the potential to impact a Class I area (generally within 62 miles [100 kilometers (km)] of the Class I area); such notification must include an analysis of the project's impact on visibility in the Class I area. If the federal land manager determines (and ADEC agrees) that a proposed project would have an adverse impact on the air, soil, vegetation, or visibility resources, then the permit application would be denied, regardless of whether the ambient air quality analysis shows compliance with ambient air quality standards and allowable increases.

Minor New Source Review Permits

ADEC developed a minor NSR permit program (codified in 18 AAC 50, Article 5) to protect ambient air quality standards from emissions from sources that do not require a major PSD NSR or major NNSR permit. ADEC requires minor permits for certain new or relocated minor sources, for certain changes at existing sources, and for specific source categories as described below.

- New Sources: A minor permit is required under 18 AAC 50.502(c)(1) for new sources if the PTE exceeds 15 tpy of PM_{10}, 40 tpy of NO_x, 40 tpy of SO_2, 0.6 tpy of Pb, 100 tpy of CO within 10 km of a nonattainment area, or 10 tpy of direct $PM_{2.5}$.
- Modifications to Existing Sources: A minor permit is required under 18 AAC 50.502(c)(3) for a modification increasing the PTE by 10 tpy of PM_{10}, 10 tpy of NO_x, 10 tpy of SO_2, 100 tpy of CO within 10 kilometers of a nonattainment area, or 10 tpy of direct $PM_{2.5}$, for sources with emissions greater than thresholds listed in 18 AAC 50.502(c)(1).
- Specific Source Categories: A minor permit is required under 18 AAC 50.502(b) for asphalt plants over 5 tons per hour of product, thermal soil remediation units over 5 tons per hour of untreated material, rock crushers with rated capacity over 5 tons per hour, one or more incinerators with cumulative capacity over 1,000 pounds per hour, coal preparation plants, and Port of Anchorage sources.

3.8.1.3.3 VISIBILITY PROTECTION REQUIREMENTS

Visibility describes visual quality, such as clarity of a vista or the distance one can see (ADEC 2011b). Visibility impairment is "any humanly perceptible change in visibility (light extinction, visual range, contrast, coloration) from that which would have existed under natural conditions" (EPA 1999a). Visibility impairment is measured in deciviews (dvs).[9] Visibility impairment is caused by aerosols and pollutant emissions (primarily SO_2, NO_x, and PM) that scatter and absorb light.

The EPA, in 1980, adopted regulations forcing states to update their SIPs for protection of visibility in Class I areas from one or several distinct sources in 40 CFR Part 51, Subpart P (40 CFR 51.300 through 307). These regulations called for determination of Best Available Retrofit

[9] As defined in 40 CFR 51.301, deciview means a measurement of visibility impairment. A deciview is a haze index derived from calculated light extinction, such that uniform changes in haziness correspond to uniform incremental changes in perception across the entire range of conditions, from pristine to highly impaired.

Technology and for identification of integral vistas. In 1999, the EPA revised the visibility regulations to incorporate regional haze (the "Regional Haze Rule"), which addresses visibility impairment from multiple sources.

Regional Haze Rule

In 1999, the EPA revised the visibility regulations to incorporate regional haze ("Regional Haze Rule), which addresses visibility impairment from multiple sources. The Regional Haze Rule (promulgated in 18 AAC 50.300 to 309) requires states to develop long-term plans for reducing pollutant emissions that contribute to visibility degradation, and within the plans, to establish goals aimed at improving visibility in Class I areas. The SIPs must address haze caused by all sources of pollutants that impair visibility, including haze resulting from smoke, vehicles, electric utility and industrial fuel burning, and other activities that generate pollution. In Alaska, two primary sources of these compounds are manmade pollution from northern Europe and Russia (Arctic Haze) and pollutants from Asian deserts and cities (Asian dust). Other sources are biogenic emissions from living organisms, sea salt, and geogenic emissions from volcanoes in Alaska (ADEC 2011b).

ADEC's long-term strategies to meet the visibility goal include:

- Ongoing air pollution control programs (including PSD NSR, BART);
- Measures to mitigate impact of construction activities (including measures for handling bulk materials in 18 AAC 50.045(d));
- Emission limitations and schedules for compliance (including BART);
- Source retirement and replacement schedules;
- Smoke management techniques for agricultural and forestry burning (including open burning in 18 AAC 50.065); and
- Enforceability of emission limitations and control measures.

ADEC would implement additional strategies and controls should existing strategies prove to be inadequate to show reasonable progress.

The mine site infrastructure and processes component of the Donlin Gold Project would be subject to regional haze requirements as implemented through the PSD NSR permitting process – and accompanying additional impact analysis on visibility, soils, and vegetation - as well as other state and federal regulations.

3.8.1.3.4 OPERATING PERMITS (TITLE V)

The required elements of operating permit programs are outlined in 40 CFR Part 70 and Part 71. Operating permits may be referred to as Title V permits. A Title V permit should list all air pollution requirements that apply to the source, including emissions limits and monitoring, record keeping, and reporting requirements. Regulations also require that the permittee annually report the compliance status of its source with respect to permit conditions to the ADEC. The definition of a major source under Title V varies according to which pollutants are emitted from the source, and the attainment designation of the area where the source is located. In general, a source is considered major for Title V if its PTE exceeds one or more of the following: 100 tpy or more of any regulated pollutant; 10 tpy or more of any single HAP; or 25 tpy or more total HAPs.

3.8.1.3.5 NEW SOURCE PERFORMANCE STANDARDS

The NSPS, codified in 40 CFR Part 60, establish requirements for new, modified, or reconstructed units in specific source categories. NSPS requirements include emission limits, monitoring, reporting, and record keeping.

Applicable NSPS for the proposed project may include the following NSPS listed below. The emission units subject to an NSPS or NESHAPs are listed in Appendix I (Air Sciences Inc. 2014a).

- 40 CFR Part 60, Subpart A – General Provisions. Subpart A contains the general requirements applicable to all emission units subject to 40 CFR Part 60.
- 40 CFR Part 60, Subpart Dc – Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units. Subpart Dc applies to each steam generating unit for which construction, modification, or reconstruction is commenced after June 9, 1989 and has a maximum design heat input capacity of 29 megawatts (MW) (100 MMBtu/hr) or less, but greater than or equal to 2.9 MW (10 MMBtu/hr). This subpart sets standards for PM and sulfur dioxide (SO_2) emissions. The proposed project would have an oxygen plant boiler and a carbon elution heater (Emission Unit IDs 33-BLR-001 and 56-BLR-200) subject to Subpart Dc.
- 40 CFR Part 60, Subpart LL – Standards of Performance for Metallic Mineral Processing Plants. The provisions of this subpart are applicable to the following affected facilities in metallic mineral processing plants that commence construction or modification after August 24, 1982: each crusher and screen in open pit mines; other crushers and screens; bucket elevators; conveyor belt transfer points; thermal dryers; product packaging stations; storage bins; enclosed storage areas; truck loading stations; truck unloading stations. This subpart sets standards for PM emissions. The proposed project would have a gyratory crusher dump pocket and rock breaker (11-BIN-100), gyratory crusher (11-CRU-100), surge pocket (11-BIN-150), apron feeder (11-FEE-150), gyratory crusher discharge conveyor (11-CVB-100), stockpile feed conveyor (14-CVB-200), coarse ore reclaim apron feeders (14-FEE-200, 210, 220, and 230), pebble crushers (16-CRU-200 and 300), Pebble Crusher Feed Surge Bin (16-BIN-350), Pebble Crusher Feeder No. 1 (16-FEE-550), Pebble Crusher Feeder No. 2 (16-FEE-560), Pebble Bypass Feeder (16-FEE-570) and pebble discharge conveyor (16-CVB-480) (Rieser 2015a).
- 40 CFR Part 60, Subpart CCCC – Standards of Performance for Commercial and Industrial Solid Waste Incineration (CISWI) Units for Which Construction Is Commenced After June 4, 2010, or for which Modification or Reconstruction Is Commenced After August 7, 2013. This subpart sets operating limits and emission limits for cadmium, CO, dioxins/furans, hydrogen chloride, Pb, Hg, opacity, PM, NO_x, and SO_2. The effective date for this subpart is August 7, 2013. Subpart CCCC applies to each incineration unit that is:
  - A new incineration unit as defined in 40 CFR 60.2015;
  - A CISWI unit as defined in 40 CFR 60.2265; and is

- Not exempt under 40 CFR 60.2020.

The proposed project would have a camp waste incinerator (Emission Unit ID CWI) subject to Subpart CCCC.

- 40 CFR Part 60, Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (CI ICE). Donlin Gold, LLC plans to use electrical power supplied by onsite generation. Subpart IIII applies to owners and operators of stationary CI ICE that commence construction after July 11, 2005, where the stationary CI ICE are manufactured after April 1, 2006, and are not fire pump engines. Subpart IIII applies to fire pumps that commenced construction after July 11, 2005, and were manufactured after July 1, 2006. This subpart sets emission standards for NO_x + non methane hydrocarbons, hydrocarbons, NO_x, CO, and PM. The proposed project would have generators and fire pumps (Emission Unit IDs W-1 to W-12, ADG1-2, BEDG1 & 2, CEDG1 to 4, and FP1 to 3) subject to Subpart IIII.
- 40 CFR Part 60, Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (SI ICE). Donlin Gold plans to use electrical power supplied by onsite generation. Subpart JJJJ applies to owners and operators of stationary SI ICE that commence construction after June 12, 2006, where the stationary SI ICE are manufactured on or after July 1, 2007. This subpart sets emission standards for NO_x, CO, and VOCs. The proposed project would have generators (Emission Unit IDs W1 to W12) at the power plant subject to Subpart JJJJ.
- 40 CFR 60, Part Subpart LLLL – Standard of Performance for New Sewage Sludge Incineration (SSI) Units. This subpart sets operating limits and emission limits for PM, hydrogen chloride, CO, dioxins/furans, Hg, NO_x, SO_2, cadmium, Pb, and fugitive emissions from ash handling. The effective date for this subpart was September 21, 2011. This subpart applies to the sewage sludge incinerator (Emission Unit ID SS1) that meets the following criteria:
  - construction commenced after October 14, 2010 or for which modification commenced after September 21, 2011;
  - is an SSI unit as defined in 40 CFR 60.4930; and
  - is not exempt under 40 CFR 60.4780.

3.8.1.3.6 NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS / MAXIMUM ACHIEVABLE CONTROL TECHNOLOGY

Hazardous Air Pollutants emissions are regulated under NESHAPs, codified in 40 CFR Part 61 and 40 CFR Part 63. 40 CFR Part 61, promulgated in 1985, regulates eight types of hazardous substances (asbestos, benzene, beryllium, coke oven emissions, inorganic arsenic (As), Hg, radionuclides, and vinyl chloride).

The EPA subsequently promulgated 40 CFR Part 63, which added 189 additional compounds to the list of HAPs. Also known as the MACT standards, 40 CFR Part 63 regulates HAP emissions from major sources of HAPs and specific source categories that emit HAPs, as well as certain minor or "area" sources of HAPs. 40 CFR Part 63 considers any source with the PTE 10 tpy or more of any single HAP, or 25 tpy or more of HAPs in aggregate, as a major source of HAPs.

Applicable NESHAPs for the proposed project, based on the types of emission units and the expected date of installation, would include the following (ARCADIS 2013a):

- 40 CFR Part 63, Subpart A – General Provisions. Subpart A contains the general requirements applicable to all emission units subject to 40 CFR Part 63.
- 40 CFR Part 63, Subpart ZZZZ – National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE). Subpart ZZZZ applies to any existing, new, or reconstructed stationary RICE located at a major or area source of HAP emissions. For stationary RICE located at an area source of HAP emissions, a stationary RICE "exists" if construction or reconstruction of the stationary RICE commenced before June 12, 2006. A stationary RICE located at an area source of HAP emissions is "new" if construction of the stationary RICE commenced on or after June 12, 2006. For area sources, this subpart sets operating limitations and emission limitations for CO and formaldehyde, as well as management practices and work practice standards. The proposed project would have generators (S1 to W2, ADG1-2, BED1-2, CEDG1-4, and FP1-3) that would be subject to Subpart ZZZZ.
- 40 CFR Part 63, Subpart JJJJJJ – National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers. Subpart JJJJJJ applies to each new, reconstructed, or existing industrial, commercial, and institutional boilers within a subcategory (coal, biomass, and oil) located at an area source. A source is considered new if construction or reconstruction of the affected source commenced after June 4, 2010 and meets the criteria at the time construction commenced. This subpart sets operating limits and emission limits for PM, CO, and Hg, as well as emission reduction measures, management practices, and work practice standards. The proposed project's auxiliary boilers (Emission Unit IDs PP-HEU-100 & 200), pressure oxidation (POX) boilers (Emission Unit IDs 17-BLR-301 & 302), and oxygen plant boiler (Emission Unit ID 33-BLR-001) would be exempt from the requirements of Subpart JJJJJJ, per 40 CFR 63.11195(e), as these boilers would be natural gas-fired boilers that burn liquid fuel only during periods of gas curtailment, gas supply interruption, startups, or periodic testing on liquid fuel. The portable heaters would also be exempt, per 40 CFR 63.11195, as these boilers would be temporary.
- 40 CFR 63.11640 Subpart EEEEEEE – National Emission Standards for Hazardous Air Pollutants for Gold Mine Ore Processing and Production Area Source Category. Subpart EEEEEEE applies to each collection of "ore pretreatment processes" at a gold mine ore processing and production facility, each collection of "carbon processes with mercury retorts" at a gold mine ore processing and production facility, each collection of "carbon processes without mercury retorts" at a gold mine ore processing and production facility, and each collection of "non-carbon concentrate processes" at a gold mine ore processing and production facility, as defined in 40 CFR 63.11651. This subpart sets gaseous emission standards for Hg; there are no regulations for the amount of Hg in dust. For a new ore pretreatment process, Hg emissions to the atmosphere from a cannot exceed 84 pounds of Hg per million tons of ore processed; and for a new carbon process with Hg retorts, Hg emissions cannot exceed 0.8 pounds of Hg per ton of concentrate processed. The proposed project would have autoclaves, kiln, electrowinning cells, retort, and furnace (Emission Unit IDs 17-AUT-101 & 102, 56-KLN-100, 37-EWN-100 to 400, 19-VEZ-100, 19-FUR-100) subject to Subpart EEEEEEE.

- 40 CFR Part 63, Subpart CCCCCC – National Emission Standards for Hazardous Air Pollutants for Gasoline-Dispensing Facilities. This subpart applies to gasoline dispensing facilities located at an area source. However, the proposed Aviation Gasoline Tank at the airport would be exempt from the requirements of Subpart CCCCCC per 40 CFR 63.111(g) (Rieser 2015a).

3.8.1.3.7 COMPLIANCE ASSURANCE MONITORING

The EPA developed CAM requirements, codified in 40 CFR Part 64, in order to provide reasonable assurance that facilities comply with emissions limitations by monitoring the operation and maintenance of their control devices. CAM requirements apply to emission units that are equipped with post-process pollutant control devices, have pre-control device emissions equal to or greater than 100 percent of the major source threshold for a pollutant as defined in 40 CFR Part 70 and Part 71, and are subject to the Title V permit program. To comply with these requirements, a CAM Plan must be developed for each affected pollutant emitted from each affected emission unit. The focus of each CAM Plan is to assure compliance with the applicable emission limit. Per 40 CFR 64.5(d), the CAM plan for the proposed project's affected emission units must be submitted as part of the application for a renewal of the Title V permit.

3.8.1.3.8 MOBILE SOURCE REGULATIONS

Mobile source air pollution control requirements for gasoline and diesel on-road engines are codified in 40 CFR Part 80, Part 85, and Part 86. Under these provisions, the EPA initially established "Tier 1," and later "Tier 2," emissions standards for the purpose of minimizing emissions from these sources. EPA's Tier 2 emission standards and gasoline sulfur control program is designed to reduce emissions from passenger cars, light trucks, and large passenger vehicles (including sport utility vehicles, minivans, vans, and pickup trucks) and to reduce the sulfur content of gasoline. These more stringent emission standards have applied to the aforementioned types of motor vehicles operating on any fuel, since 2004. These reductions are intended to provide for cleaner air and greater public health protection, primarily by reducing O_3 and PM pollution.

Provisions for non-road diesel engines are codified in 40 CFR Part 89 and Part 90. Starting in 1996, non-road engines became subject to EPA's increasingly stringent Tier I through Tier 4 emissions standards, depending on model year and engine size. These requirements are imposed on the manufacturers of these mobile sources rather than on owners or operators.

The EPA's mobile source regulations in 40 CFR Part 80, Subpart I (Motor Vehicle Diesel Fuel; Non-road, Locomotive, and Marine Diesel Fuel; and U.S. Emissions Control Area Marine Fuel) contain provisions restricting diesel fuel sulfur content for fuel used in mobile sources, in order to prevent damage to the emission control systems. These restrictions were phased in for highway diesel fuel starting in 2006 and for non-road diesel fuel in 2007. Alaska had a slightly different implementation schedule than the rest of the country, but as of December 1, 2010, all parts of Alaska (urban and rural) are required to use ultra-low sulfur diesel (ULSD) with a maximum sulfur content of 15 parts per million (ppm) (0.0015 percent sulfur) in on-road vehicles and non-road equipment, as is required in the other states.

In collaboration with the National Highway Traffic Safety Administration, the EPA implemented regulations for GHG emission standards for light-duty and heavy-duty vehicles, and for heavy-duty engines, for the purpose of reducing GHG emission from these sources. These regulations are codified in 40 CFR Parts 85, 86, 600, 1033, 1036, 1037, 1039, 1065, 1066, and 1068.

In 40 CFR Part 80, the EPA implemented the Renewable Fuel Standards (RFS) requiring transportation fuel sold in the U.S. to contain a minimum volume of renewable fuel. The purpose of the RFS is to reduce GHG emissions, as well as to support the nation's renewable fuel industry and reduce the nation's dependence on imported petroleum.

The proposed project would include use of both on-road and non-road engines subject to mobile source regulations and associated emissions standards. Although Donlin Gold, LLC would have no direct compliance responsibility with regard to vehicles and engine emissions standards, the equipment selected would impact the total air emissions from the Donlin Gold Project.

Donlin Gold would be subject to ULSD fuel requirements for all proposed project components.

3.8.2 AFFECTED ENVIRONMENT

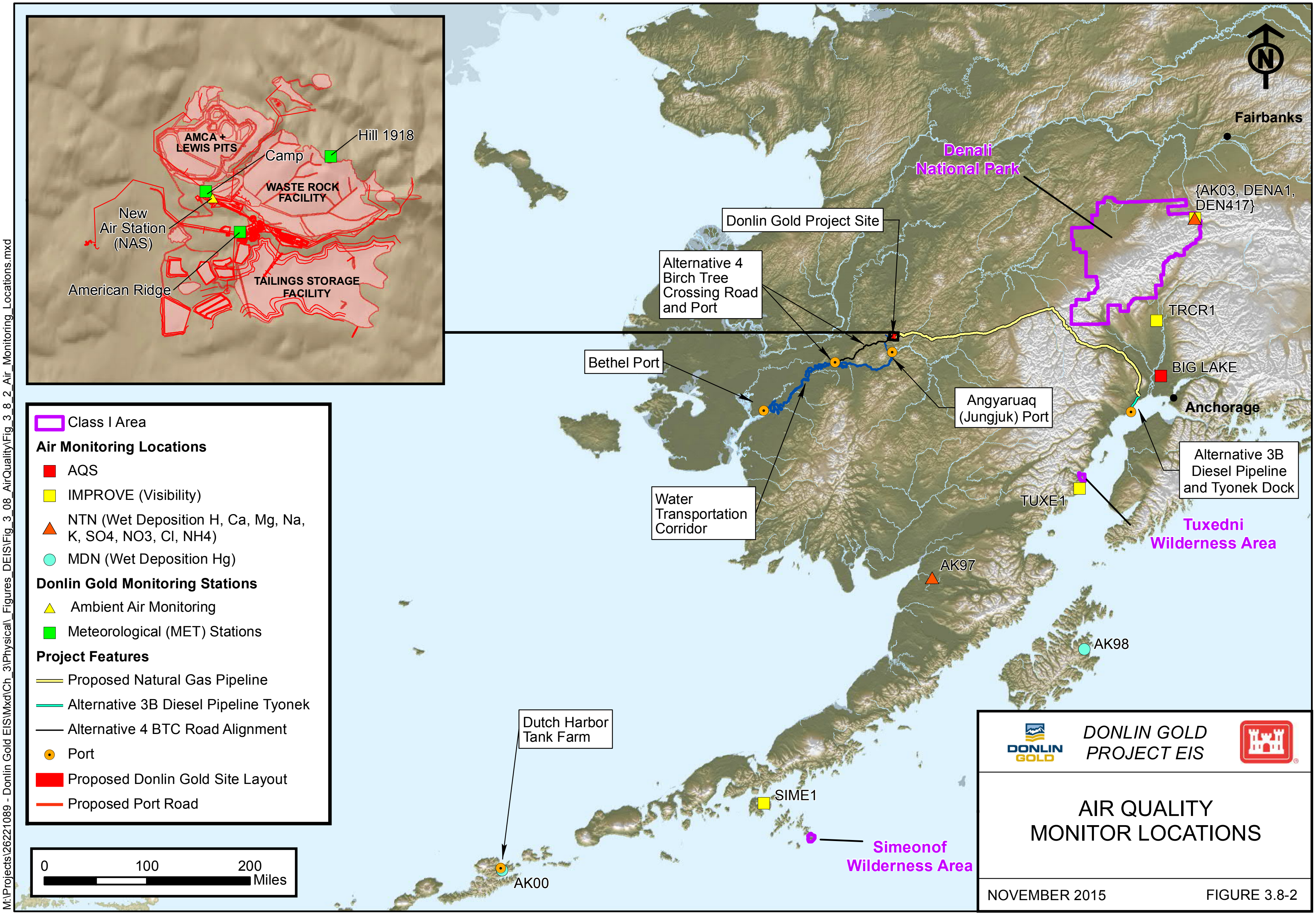
This section presents baseline ambient air quality data for each proposed project component. According to the most recent available information and studies conducted in the EIS Analysis Area, the baseline ambient air in the region are well within the National and Alaska State ambient air quality standards (as discussed in the sections below).

3.8.2.1 MINE SITE

Donlin Gold conducted an ambient air quality field monitoring program to collect baseline data in support of the PSD permit application for the mine site component of the proposed project. This monitoring was conducted in accordance with Quality Assurance Project Plans (QAPPs) effective March 3, 2006 through July of 2009 (when the program was discontinued), and a new QAPP effective October 1, 2010 (MMA 2010c [as revised through November 15, 2010]; MMA 2011d). The QAPPs describe the methods and requirements for ambient air quality data collection. ADEC approved both QAPPs, indicating agreement that Donlin Gold's methodology is appropriate for PSD modeling. Criteria pollutant data were collected at two monitoring stations: the New Air Station and the Camp Station[10] as shown on Figure 3.8-2. PM monitoring data were collected at the Camp Station from July to late September 2006 (MMA 2008a), and at the New Air Station from late September 2006 through 2009 (MMA 2008a, b, c, 2009c). Gaseous pollutant (SO_2, NO_x, CO, O_3) data were collected at the New Air Station starting November of 2006 through December 2008 (MMA 2008d, 2009b). Donlin Gold restarted the ambient gaseous monitoring program for O_3 and oxides of nitrogen (NO_x) at New Air Station in October of 2010 (MMA 2011d). Additional air monitoring data are available on EPA's Air Data website (EPA 2013b).

During data collection, onsite activities included the daily operations of the exploration program and associated mining camp and airstrip, and an offsite placer mining operation about 2 miles north of the Donlin Gold Project (MMA 2005).

[10] The "Camp Station," at which PM data was collected from July to September 2006, is located at the current exploration camp. The monitor was moved to the New Air Station (NAS) in September of 2006. This "Camp Station" is not the same as the proposed mine camp location to be used during mine operations.



DONLIN GOLD PROJECT EIS

AIR QUALITY MONITOR LOCATIONS

NOVEMBER 2015

FIGURE 3.8-2

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3.8.2.1.1 CRITERIA POLLUTANT DATA

The air sampling methods used at the New Air Station and Camp Station are listed in Table 3.8-5.

Table 3.8-5: New Air Station and Camp Station Measurement Methods

Measured Parameter	Measurement Method effective March 2006	Measurement Method effective October 2010
PM_{10}	Gravimetric Analysis EPA Reference Method Designation RFPS-0202-141	N/A
$PM_{2.5}$	Gravimetric Analysis EPA Reference Method Designation EPQM-0202-142 & RFPS-0498-116	N/A
CO	Gas Filter Correlation NDIR EPA Federal Equivalent Method Designation EQOA-0992-087	N/A
NO_x	Chemiluminescence EPA Federal Reference Method Designation RFNA-1194-099	Chemiluminescence EPA Federal Reference Method Designation RFNA-1194-099
O_3	Ultraviolet Photometry EPA Equivalent Method Designation EQOA-0881-052	UV Photometric Absorption EPA Federal Equivalent Method Designation EQOA-0992-087
SO_2	Pulsed Fluorescence EPA Federal Equivalent Method Designation EQSA-0495-100	N/A

Notes:
CO = Carbon monoxide
N/A = Not applicable
NO_x = Oxides of nitrogen
O_3 = Ozone
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively
SO_2 = Sulfur dioxide

Source: MMA 2010c, 2011d.

A summary of the baseline ambient air quality concentrations in the area of the proposed mine site is presented in Table 3.8-6. The available data in this area confirm that ambient pollutant concentrations comply with the respective NAAQS and AAAQS.

The data presented in the table is the best available data for characterizing the existing air quality at the mine site for purposes of the EIS. ADEC will review Donlin Gold, LLC's monitoring data to ensure accuracy and representativeness as part of the PSD permitting process under 18 AAC 50 and 40 CFR 52.21.

Table 3.8-6: Baseline Ambient Air Quality Data Collected at New Air Station and Camp Monitoring Stations

	Averaging Time	Monitored Value and Description (Monitoring Station/Year)		Monitoring Station and Data Collection Dates	Primary NAAQS (% of Primary NAAQS)	AAAQS (% of AAAQS)[b]
PM_{10}	24-hour	14.0 µg/m^3 (NAS/2008)	Maximum 2nd High Value for data collection period	Camp and NAS - July 1, 2006 to June 30, 2007 (MMA 2008b);[a] and NAS - July 1, 2007 to June 30, 2008 (MMA 2008c)	150 µg/m^3 (9%)	150 µg/m^3 (9%)
$PM_{2.5}$	Annual	2.3 µg/m^3 (NAS/2008)	Highest 12-month rolling annual 24-hour mean for data collection period	Camp and NAS - July 1, 2006 to December 31, 2007 (MMA 2008a);[a] and NAS - January 1, 2008 to December 31, 2008 (MMA 2009c)	12 µg/m^3 (19%)	15 µg/m^3 (15%)
	24-hour	12 µg/m^3 (NAS/2008)	Highest 24-hour value for data collection period[b]	Camp and NAS - July 1, 2006 to December 31, 2007 (MMA 2008a)[a] and NAS - January 1, 2008 to December 31, 2008 (MMA 2009c)	35 µg/m^3 (34%)	35 µg/m^3 (34%)
SO_2	Annual	<0.0005 ppm (NAS/2007 and 2008)	Highest 12-month rolling annual mean for data collection period	NAS - November 18, 2006 to November 17, 2007 (MMA 2008d); and NAS - January 1, 2008 to December 31, 2008 (MMA 2009b)	N/A	0.030 ppm (2%)
	24-hour	0.002 ppm (NAS/2007 and 2008)	Maximum 2nd High for data collection period	NAS - November 18, 2006 to November 17, 2007 (MMA 2008d); and NAS - January 1, 2008 to December 31, 2008 (MMA 2009b)	N/A	0.14 ppm (1%)
	3-hour	0.002 ppm (NAS/2007 and 2008)	Maximum 2nd High Value for data collection period	NAS - November 18, 2006 to November 17, 2007 (MMA 2008d); and NAS - January 1, 2008 to December 31, 2008 (MMA 2009b)	N/A	0.50 ppm (<1%)
	1-hour[c]	na	na	na	75 ppb	75 ppb

Table 3.8-6: Baseline Ambient Air Quality Data Collected at New Air Station and Camp Monitoring Stations

	Averaging Time	Monitored Value and Description (Monitoring Station/Year)		Monitoring Station and Data Collection Dates	Primary NAAQS (% of Primary NAAQS)	AAAQS (% of AAAQS)[b]
CO	8-hour	0.4 ppm (NAS/2007)	Maximum 2nd High Value for data collection period	NAS - November 18, 2006 to November 17, 2007 (MMA 2008d); and NAS - January 1, 2008 to December 31, 2008 (MMA 2009b)	9 ppm (4%)	9 ppm (4%)
	1-hour	0.6 ppm (NAS/2007)	Maximum 2nd High Value for data collection period	NAS - November 18, 2006 to November 17, 2007 (MMA 2008d); and NAS - January 1, 2008 to December 31, 2008 (MMA 2009b)	35 ppm (2%)	35 ppm (2%)
NO_2	Annual	0.001 ppm (NAS/2007, 2008, and 2013)	Highest annual mean for data collection period	NAS - November 18, 2006 to November 17, 2007 (MMA 2008d); NAS - January 1, 2008 to December 31, 2008 (MMA 2009b); NAS - December 1, 2010 to November 30, 2011 (MMA 2012d); and NAS - April 17 to April 16, 2013 (MMA 2013)	0.053 ppm (2%)	0.053 ppm (2%)
	1-hour	0.014 ppm (NAS/2012)	Highest 1-hour value for data collection period[d]	December 1, 2010 to November 30, 2011 (MMA 2012d); NAS - April 17, 2012 to April 16, 2013 (MMA 2013)	0.100 ppm (14%)	0.100 ppm (14%)

Table 3.8-6: Baseline Ambient Air Quality Data Collected at New Air Station and Camp Monitoring Stations

	Averaging Time	Monitored Value and Description (Monitoring Station/Year)		Monitoring Station and Data Collection Dates	Primary NAAQS (% of Primary NAAQS)	AAAQS (% of AAAQS)[b]
O_3	8-hour (NAS/2011)	0.052 ppm	Highest 8-hour running value for data collection period[e]	NAS - December 1, 2010 to November 30, 2011 (MMA 2012d); and NAS - April 17, 2012 to April 16, 2013 (MMA 2013)	0.075 ppm (69%)	0.075 ppm (69%)

Notes:

a Monitor relocated from the Camp monitoring station to New Air Station in September 2006. The $PM_{2.5}$ data collected from July 1, 2006 to December 31, 2007 (MMA 2008a) are informational only and were not reviewed for PSD quality.
b The 98th percentile monitored 24-hour $PM_{2.5}$ value is not available in MMA 2009c, so the highest value is shown in this table. The value is still below the standard.
c The monitoring reports do not include 1-hour SO_2 data because the standard was not in effect when the studies were conducted.
d The 98th percentile monitored 1-hour NO_2 value is not available in MMA 2012d or 2013, so the highest value is shown in this table. The value is still below the standard.
e The 4th high monitored 8-hour O_3 value is not available in MMA 2012d or 2013, so the highest value is shown in this table. The value is still below the standard.

AAAQS = Alaska Ambient Air Quality Standard
CO = Carbon monoxide
na = Not available
N/A = Not applicable
NAAQS = National Ambient Air Quality Standard
NO_2 = Nitrogen dioxide
O_3 = Ozone
NAS = New Air Station
ppm = Parts per million
ppb = Parts per billion
SO_2 = Sulfur dioxide
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively

Sources: ADEC 2015a; EPA 2013a; MMA 2008a, b, c, d, 2009b, c, 2012d, 2013.

3.8.2.1.2 MERCURY

Atmospheric mercury may come from natural (vegetation, biomass burning, volcanoes, and surface waters) or anthropogenic sources (coal combustion, waste incineration, and mining activities) from sources within the state or beyond. Natural sources of emissions of mercury into the air can include mercury previously deposited on land and water surfaces (Environ 2014b).

There are three types of mercury air emissions produced by gold mining: elemental mercury vapor (Hg^0), gaseous divalent mercury (Hg^{II}), and particulate-bound mercury (Hg_P). The most common type is Hg^0, which is also the longest lived in the atmosphere, and is considered a global pollutant (Environ 2014b). Hg^{II} and Hg_P are more soluble and reactive and settle out of the atmosphere more quickly through wet and dry deposition (discussed below). The mercury source in the Project Area is a stable sulphide mineral called cinnabar (HgS), which has less risk of release to the atmosphere than the elemental form of Hg. However, some fraction of the mercury present in the ore as cinnabar would be liberated during processing; because extreme heat and pressure would be applied to the ore, Hg would be liberated from the ore as a gas. The gas, if not captured, would have the potential to oxidize and methylate. The ore from the project would be from the Kuskokwim gold belt, which contains naturally occurring Hg at an estimated concentration of 1.62 ppm (Air Sciences Inc. 2015b). Donlin Gold collected ambient data on Hg at the New Air Station (ARCADIS 2013a), and at the Camp station (Environ 2013) as shown in Table 3.8-7.

Table 3.8-7: Measured Baseline Ambient Air Mercury Concentrations

Monitoring Station	Distance from Project Area (mi)	Data Collection Period	Monitoring Methodology	Total Hg (ng/m^3)	Hg^0 (ng/m^3)	Hg^{II} (pg/m^3)	Hg_P (pg/m^3)
New Air Station	0	May 12, 2007 to September 10, 2008	40 CFR Part 75, Appendix K	0.815[a]	NA	NA	NA
Camp	0	September 1, 2011 through September 6, 2012	MDN Monitoring Protocols[b]	1.45	1.4	3.9	8.4

Notes:

a Average of 75 samples collected during the sampling period of May 12, 2007 to September 10, 2008. The highest and lowest mercury concentrations were 2.201 and 0.313 ng/m^3, respectively (ARCADIS 2013a).

b Measured continuously using Tekran® 2537 automated Mercury Monitor coupled with Tekran® 1130 and 1135 Speciation. Hg^{II} and Hg_p measured every two to three hours. Hg^0 measured continuously and reported every two to three hours to coincide with Hg^{II} and Hg_p (Environ 2013).

Hg = Mercury
Hg^0 = Elemental mercury vapor
Hg^{II} = Gaseous divalent mercury
N/A = Not applicable
Hg_P = Particle bound mercury
ng/m^3 = Nanogram per cubic meter
pg/m^3 = Picogram per cubic meter

Sources: ARCADIS 2013a; Environ 2013.

Donlin Gold conducted global-scale modeling using the GEOS-Chem model to simulate mercury air (and deposition) concentrations in the Donlin Gold Project Area, and determine the sources contributing to existing Hg levels in the Project Area. Modeling results indicate baseline annual Hg^0, Hg^{II}, and Hg_P air concentrations of 1.6 ng/m³, 8.6 pg/m³, and 0.43 pg/m³, respectively, in the Donlin Gold Project grid cell for calendar year 2008 (Environ 2014b). Donlin Gold refined these values with regional-scale modeling using EPA's Community Modeling Air Quality (CMAQ) system Version 5.0. Regional modeling, also for calendar year 2008, results show baseline Hg^0 concentration of 1.45 ng/m³, which is comparable to the measured value of 1.4 ng/m³ shown in Table 3.8-7 (Environ 2013, 2014c).

Environ (2014b) states that mercury air concentrations (and deposition) in Alaska are largely due to global transport of anthropogenic emissions from Asia, natural mercury emissions, and legacy (previously deposited anthropogenic) mercury emissions. At the Donlin Gold mine site, it is estimated that the contribution of North American anthropogenic Hg emissions are less than 5 percent of total Hg deposition.

3.8.2.1.3 WET AND DRY DEPOSITION OF MERCURY

Deposition of Hg to the ground from the air can be wet (occurring as rain, sleet, sleet, or snow), or dry (occurring as particulate). The Mercury Deposition Network (MDN) tracks wet deposition of Hg (NADP 2013). MDN sites are located at Dutch Harbor (AK00) operated by ADEC since 2009, Gates of the Arctic National Park – Bettles (AK06) operated by NPS since 2008, Glacier Bay National Park – Bartlett Cove (AK05) operated by NPS since 2008, Kodiak (AK98) operated by ADEC since 2007, and Ambler (AK99) (NADP 2013). The Ambler site is currently inactive (Environ 2014b). The sites closest to the proposed project (AK00, AK98) are shown on Figure 3.8-2.

Donlin Gold collected wet (total Hg) and dry (Hg^{II}) deposition monitoring at the Camp Station (Table 3.8-8). This site is shown on Figure 3.8-2.

Table 3.8-8: Measured Mercury Deposition

Monitoring Station	Distance from Project Area (mi)	Data Collection Period	Annual[a] Wet Deposition of Total Hg (Hg^0, Hg^{II}, Hg_P) (µg/m²)	Annual Dry Deposition of Hg^{II} (µg/m²)
Methodology			**MDN Protocol**	**Surrogate surface method**
Camp	0	October 25, 2011 to October 24,2012 (except February 29, 2012 to April 9, 2012)	2.6	1.5

Notes:
a Based on average weekly value and 52 weeks.
b The resulting total (Hg^0, Hg^{II}, Hg_P) dry deposition is 5.8 µg/m², calculated by adding measured annual dry deposition of Hg^{II} of 1.5 µg/m² (Environ 2013) plus annual modeled Hg^0 and Hg_P of 3.8 µg/m² and 0.5 µg/m², respectively (Environ 2014c).
Hg = Mercury
µg/m² = Microgram per square meter
Hg^0 = Elemental mercury vapor
Hg^{II} = Gaseous divalent mercury
Hg_P = Particle bound mercury
Sources: Environ 2013, 2014c.

The previously mentioned Environ 2014b global-scale study simulated total (Hg^0, Hg^{II}, and Hg_p) wet and dry Hg deposition of 11.6 µg/m² for 2008 near the Donlin Gold Project. Environ (2014b) indicates that the largest contribution to deposition is natural (pre-industrial) at 34 percent, followed by legacy (previously deposited human-caused emissions) at 27 percent, anthropogenic from Asia at 23 percent, and North American anthropogenic at less than 5 percent.

These global-scale modeling results were refined in a subsequent regional-scale Hg modeling study (Environ 2014c). Two regional-scale simulations were conducted using CMAQ – one that incorporated an algorithm accounting for bidirectional Hg emission and re-emissions of mercury, and one that did not. The purpose of the first simulation was for model evaluation. The purpose of the second simulation (with no algorithm) was to estimate representative baseline levels of Hg^0 and Hg_P dry deposition. These values are used for assessing project impacts using CALPUFFas CALPUFF does not consider bidirectional Hg deposition and re-emissions. The resulting total baseline Hg deposition is 8.4 µg/m² at Camp (obtained by "adding measured baseline annual wet deposition of total Hg [2.6 µg/m² at Camp] and dry deposition of Hg^{II} [1.5 µg/m² at Camp] to the CMAQ-modeled dry deposition of other species [3.78 µg/m² plus 0.50 µg/m²]" (Environ 2014c), and 7.8 µg/m² at Crooked Creek Village (Environ 2014c).

3.8.2.1.4 VISIBILITY DATA

As required by EPA's (1999) Regional Haze Rule, ADEC determined visibility conditions in all Class I areas for 2000 through 2004 (the "baseline" years for showing reasonable further progress). Baseline conditions represent visibility for the best and worst days during the time period of 2000 to 2004. ADEC determines visibility using actual pollutant concentrations measured at Interagency Monitoring of Protected Visual Environments (IMPROVE) stations (ADEC 2011b). Figure 3.8-2 shows locations of IMPROVE monitoring station locations for Denali National Park (DENA1 and TRCR1), Tuxedni (TUXE1), and Simeonof (SIME1) (EPA 2013d).

Due to distance and geography, visibility data collected at these stations would not likely be characteristic of the proposed mine site. However, ADEC has characterized the Yukon-Kuskokwim Delta region as "…quite windy, experiencing winds between 15-25 miles per hour throughout the year. These winds, coupled with fine delta silt, help to create dust problems for some southwestern communities" (ADEC 2011b).

In addition, ADEC has indicated that Alaska overall is affected by international long-range transport of aerosols: "International transport of pollutants into Alaska has been documented through a variety of research studies. In particular, the research has focused on Arctic haze and Asian dust" (ADEC 2011b).

3.8.2.2 TRANSPORTATION FACILITIES

3.8.2.2.1 POLLUTANT DATA

The transportation facilities component of the proposed project (including the Bethel Port, river traffic, Angyaruaq [Jungjuk] Port, Birch Tree Crossing [BTC] Port, the Angyaruaq [Jungjuk] and BTC mine access roads, airstrip, and Dutch Harbor tank farm) would not trigger any ambient air quality monitoring requirements for PSD or minor air quality permitting. Thus, no site-specific monitoring for criteria pollutants or ambient Hg concentrations was conducted. Donlin Gold collected wet and dry Hg data at Aniak and Crooked Creek as described below, and the proposed mine site would be relatively close to some parts of the transportation facilities component.

Additional pollutant data are available from the EPA's Air Quality System (AQS) on EPA's Air Data website (EPA 2013b). None of the stations listed on the website would provide potentially representative[11] data. Thus, the New Air Station pollutant data shown in Table 3.8-6 are the best available data for the area where the airstrip, the mine access road, and Angyaruaq (Jungjuk) Port would be located, as well as the portion of the river traffic and BTC mine access road within 50 miles of the New Air Station. There are no representative pollutant monitoring data available for the remaining components of the transportation facility category because of distance and / or surrounding area land use.

3.8.2.2.2 MERCURY

The Project Area contains Hg due to existing natural and anthropogenic sources (ARCADIS 2014). As noted previously, the transportation facilities component of the project would not trigger any ambient air quality permitting requirements or requirements to collect ambient Hg data; thus, site specific ambient air quality monitoring was not conducted. However, the mine site is relatively close to some parts of the transportation facilities component. Therefore, the ambient Hg data discussed in Section 3.8.2.1.2 are the best available data for the area where the airstrip, Angyaruaq (Jungjuk) Port, river traffic, and mine access roads lie within 50 miles of the New Air Station.

There are no additional ambient Hg data for the rest of the transportation facilities component, so the data collected at the Camp Station is considered most representative.

3.8.2.2.3 WET AND DRY DEPOSTION OF MERCURY

Wet and dry Hg deposition data availability in Alaska is discussed in Section 3.8.2.1.3, and site locations are shown on Figure 3.8-2. The AK00 MDN Site is located near Dutch Harbor, and provides wet Hg deposition data representative of the area where the Dutch Harbor tank farm would be located. This data is shown in Table 3.8-9.

Table 3.8-9: Annual Hg Wet Deposition at AK00

Site	Distance from Project Area	Deposition (μg/m^2)	
		2011	2012
AK00	3 mi. SE	5.554	3.481

Notes:
Hg = Mercury   μg/m^2 = Microgram per square meter
mi = Miles   SE = Southeast

Sources: NADP 2013.

[11] For purposes of this report, a pollutant monitoring station is considered to have potentially representative pollutant data if it (1) lies within about 50 miles of a project component, (2) is located in a similar land use category, and (3) has criteria pollutant data since 2000.

Wet and dry Hg deposition representative of the Kuskokwim River portion of the transportation facilities component are shown below in Table 3.8-10.

Table 3.8-10: Measured Mercury Deposition

Monitoring Station	Distance from Project Area	Data Collection Period	Annual[a] Wet Deposition of Total Hg (Hg^0, Hg^{II}, Hg_P) ($\mu g/m^2$)	Annual Dry Deposition of Hg^{II} ($\mu g/m^2$)
Methodology			MDN Protocol	Surrogate surface method
Aniak	53 mi SW	October 25, 2011 to October 24,2012 (except March 1, 2012 to April 8, 2012)	2.8	1.2[b]
Crooked Creek	13 mi SW	July 9, 2011 to July 10, 2013 (except no dry deposition measurements from July 9, 2012 to July 16, 2012)	2.4	1.1[c]

Notes:

a Based on average weekly value and 52 weeks.

b The resulting total (Hg^0, Hg^{II}, Hg_P) dry deposition at Aniak is 5.5 $\mu g/m^2$, calculated by adding measured annual dry deposition of Hg^{II} of 1.2 $\mu g/m^2$ (Environ 2013) plus annual modeled Hg^0 and Hg_p of 3.8 $\mu g/m^2$ and 0.5 $\mu g/m^2$, respectively (Environ 2014c).

c The resulting total (Hg^0, Hg^{II}, Hg_P) dry deposition at Crooked Creek is 5.4 $\mu g/m^2$, calculated by adding measured annual dry deposition of Hg^{II} of 1.1 $\mu g/m^2$ (Environ 2013) plus annual modeled Hg^0 and Hg_p of 3.8 $\mu g/m^2$ and 0.5 $\mu g/m^2$, respectively (Environ 2014c).

Hg = Mercury
Hg^0 = Elemental mercury vapor
Hg^{II} = Gaseous divalent mercury
Hg_P = Particle bound mercury
$\mu g/m^2$ = Microgram per square meter
mi = Miles
SW = Southwest

Sources: Environ 2013, 2014c.

3.8.2.2.4 VISIBILITY DATA

ADEC determines visibility using pollutant concentrations measured at IMPROVE stations (ADEC 2011b). Figure 3.8-2 shows locations of IMPROVE monitoring station locations for Denali National Park (DENA1 and TRCR1), Tuxedni Wilderness Area (TUXE1), and Simeonof Wilderness Area (SIME1) (EPA 2013d).

Due to distance and geography[12], visibility data collected at these stations is not likely to be representative of the area of the Bethel Port, river traffic, the Angyaruaq (Jungjuk) and BTC ports and roads, or airstrip. However, SIME1 (in Simeonof Wilderness Area) is located within 300 miles of the Dutch Harbor tank farm; both sites are rural or semi-rural; and both are coastal locations on the Alaska Peninsula. Therefore SIME1 data are presented in Table 3.8-11 as the best available data for the transportation facilities.

[12] Due to the larger scale regional impacts of regional haze compared to pollutant data, an IMPROVE monitoring station is considered to have potentially representative visibility data if it (1) lies within 300 miles of a project component, (2) is located in a similar land use category, and (3) is not separated from the Project Area by a mountain range.

Table 3.8-11: Historical Visibility Conditions at SIME1

Monitoring Station	Distance from Project Area	Worst Days (2000-2004)		Best Days (2000-2004)	
		dvs	Miles	dvs	Miles
SIME1	264 mi ENE	18.6	47[a]	7.6	248[a]

Notes:
a Estimated based on 53.4 inverse megameters (Mm^{-1}) for worst days, and 9.6 Mm^{-1} for best days.
dvs = deciviews (A measurement of visibility. One deciview represents the minimal perceptible change in visibility to the human eye.)
ENE = East North East
mi = Miles
Source: ADEC 2011b.

In addition, ADEC (2011b) has indicated that visibility in Alaska overall is affected by international long range transport of aerosols such as manmade pollutants from Europe and Asian dust.

3.8.2.3 PIPELINE

3.8.2.3.1 CRITERIA POLLUTANT DATA

The pipeline component of the proposed project (including right-of-way [ROW], compressor station, pig launcher and receiver station, main line valves, temporary work areas, Tyonek Port, and diesel pipeline) would not trigger any ambient air quality monitoring requirements for PSD or minor air quality permitting. Thus, no site-specific monitoring for criteria pollutants, Hg, or deposition was conducted. However, the mine site is relatively close to parts of the pipeline component. Therefore, the data shown in Table 3.8-6 are characteristic of the portions of the pipeline located on the west side of the airshed divide, at about pipeline Milepost (MP) 120.

Additional air monitoring data from the AQS is available on EPA's Air Data website (EPA 2013b). The Big Lake monitoring station (AQS 02-170-0004) shown on Figure 3.8-2, located 20 miles from the closest part of the pipeline, is the only station on the EPA website with data[13] that is characteristic of the pipeline component area. Data from this station are potentially representative of the eastern portion of the proposed pipeline. The only criteria pollutant data available from the Big Lake monitoring station are for 24-hour $PM_{2.5}$, collected from 2000 to 2002. The Big Lake station 24-hour $PM_{2.5}$ data are shown in Table 3.8-12.

[13] For purposes of this report, monitoring stations are considered to have potentially representative pollutant data if they (1) are within about 50 miles of any part of the transportation facilities or the natural gas pipeline components of the project, (2) are in a rural or semi-rural area, and (3) have criteria pollutant data since 2000.

Table 3.8-12: Big Lake 24-hour $PM_{2.5}$ Baseline Ambient Air Quality Data

Monitored Value and Description		Data Collection Dates	NAAQS (% of NAAQS)[a]	AAAQS (% of AAAQS)[a]
31.2 µg/m³	Highest 24-hour value for data collection period	2000 to 2002	35 µg/m³ (89%)	35 µg/m³ (89%)

Notes:
a The percentages are based on description of the monitored value. They do not indicate attainment status, as some standards allow for exceedances.

AAAQS = Alaska Ambient Air Quality Standard
µg/m³ = Microgram per cubic meter
NAAQS = National Ambient Air Quality Standard
µg = Micrograms
$PM_{2.5}$ = Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers

Source: EPA 2013b.

3.8.2.3.2 MERCURY

The Project Area contains Hg due to existing natural and anthropogenic sources (ARCADIS 2014). As noted previously, the pipeline component of the project would not trigger any ambient air quality permitting requirements or requirement to collect ambient Hg data; thus site-specific ambient air quality monitoring was not conducted. However, the mine site is relatively close to some of the pipeline component of the project. Therefore, the ambient Hg data discussed in Section 3.8.2.1.2 are considered characteristic of portions of the pipeline located within the west side of the airshed divide, at about pipeline MP 120.

There are no additional ambient Hg data for the rest of the pipeline component.

3.8.2.3.3 WET AND DRY DEPOSITION OF MERCURY

Wet and dry deposition data availability in Alaska is discussed in Section 3.8.2.1.3, and site locations are shown on Figure 3.8-2. However, the mine site is relatively close to some of the pipeline component of the project. Therefore, the Hg deposition data shown in Table 3.8-8 are considered characteristic of portions of the pipeline located within the west side of the airshed divide, at about pipeline MP 120.

3.8.2.3.4 VISIBILITY DATA

ADEC determines visibility using pollutant concentrations measured at IMPROVE stations (ADEC 2011b). Figure 3.8-2 shows locations of IMPROVE monitoring station locations for Denali National Park (DENA1 and TRCR1), Tuxedni Wilderness Area (TUXE1), and Simeonof (SIME1) (EPA 2013d).

Due to distance and geography[14], visibility data collected at these stations would not likely be characteristic of the western portion of the pipeline component. However, stations TRCR1

[14] Due to the more regional impacts of regional haze compared to pollutant data, an IMPROVE monitoring station is considered to have potentially representative visibility data if it (1) lies within 300 miles of a project component, (2) is located in a similar land use category, and (3) is not separated from the Project Area by a mountain range.

(located at Trapper Creek) and TUXE1 (located at Tuxedni Wilderness Area) are on the same side of the Alaska Range as the proposed eastern portion of the pipeline (including the compressor station, Tyonek Port, and diesel pipeline), are rural or semi-rural, and are within 300 miles of the project. Therefore, the data from TUXE1 and TRCR1 are presented in Table 3.8-13 as the best available data.

Table 3.8-13: Historical Visibility Conditions at TRCR1 and TUXE1

Monitoring Station	Distance from Project Area	Worst Days (2000-2004)		Best Days (2000-2004)	
		dvs	Miles	dvs	Miles
TUXE1	45 mi SSE	14.1	56	4.0	163
TRCR1	107 mi NNE	11.6	73	3.5	172

Notes:
dvs = deciviews
mi = miles
NNE = North North East
SSE = South South East
Source: ADEC 2011b.

Although both TUXE1 and TRCR1 are influenced by sea salt, the TUXE1 monitoring site is influenced by sea salt to a greater extent (ADEC 2011b). The proposed compressor station would be 3 miles from Cook Inlet, so the data from TUXE1 is likely more characteristic of the area where the compressor station would be located than that from TRCR1.

In addition, ADEC (2011b) has indicated that visibility in Alaska overall is affected by international long-range transport of aerosols, such as manmade pollutants from Europe and Asian dust.

3.8.2.4 CLIMATE CHANGE

Climate change is affecting resources in the EIS Analysis Area and trends associated with climate change are projected to continue into the future. Section 3.26.3 discusses climate change trends and impacts to key resources in the physical environment including atmosphere, water resources, and permafrost. Current and future effects on air quality are tied to atmospheric changes (discussed in Section 3.26.3.1).

3.8.3 ENVIRONMENTAL CONSEQUENCES

This section addresses the air quality impacts during construction, operations and maintenance, and closure and reclamation phases of the Donlin Gold Project. Direct and indirect impacts are evaluated for each phase. Air emissions associated with the proposed project consist of emissions from fugitive, mobile, and stationary air pollution sources as described below.

- Fugitive sources are those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening (40 CFR 52.21(b)(20)). Fugitive emissions can be particulate or gaseous. Examples of particulate fugitive emissions associated with the project are fugitive dust from construction activities or other activities that disturb the soil, vehicle traffic, wind erosion of exposed surfaces, and material handling. An example of gaseous fugitive emissions associated with the project would be GHG emissions due to leaks from natural gas pipeline and compressor station valves and fittings.

- Mobile sources are highway and off-highway point sources. Examples of mobile sources associated with the project are trucks, buses, earth-moving equipment, ships, and airplanes.
- Stationary sources are all point sources of air pollution except for mobile sources. Examples of stationary sources associated with the project are mining process activities (for which emissions pass through a stack or vent), power plant generators, and incinerators.

Fugitive, mobile, and stationary emissions all contribute to air quality impacts, but the emissions from each category are handled differently under air quality control regulations. When determining permitting triggers, mobile emissions are not included and neither are the fugitive emissions for the gold mine ore processing and production area source category. However, these emissions may be considered when determining a project's impact on the AAAQS. Criteria pollutants and HAPs from mobile sources of air pollution are regulated through the manufacturer and are also subject to federal fuel sulfur standards. Stationary source emissions are subject to state and federal emissions standards and permitting requirements.

In addition to criteria pollutant emissions, the project would generate ammonia, hydrogen sulfide, and HAP emissions (including arsenic, Hg, Pb, and hydrogen cyanide). Mercury emissions are of special concern for the Donlin Gold Project. Mercury is highly toxic, and the methylated form affects the environment through bioaccumulation. Mercury from natural and anthropogenic sources is already present in the Project Area, and it is associated with the gold ore found at the project (SRK 2014a). The following summarizes the various forms of Hg found in the atmosphere, and their fate in the environment (SRK 2014a; Environ 2015).

- Elemental Hg vapor (Hg^0) is a gaseous form of Hg. It is the most common form of atmospheric Hg, on a global basis, total atmospheric Hg is comprised of approximately 90 percent Hg^0 (Environ 2015). It deposits relatively slowly and may travel long distances.
- Gaseous divalent Hg (Hg^{II}) may exist as a solid or gas in the atmosphere. It deposits to the surface relatively quickly through wet or dry deposition, thus tends to settle close to its source.
- Particulate-bound Hg (Hg_p) is emitted either directly as PM from the source or first emitted in gaseous form and then collects on atmospheric particles. Wet and dry deposition rates are slower than Hg^{II} and quicker than Hg^0.

Mercury emissions have the potential to occur from stationary and fugitive sources at the mine site. The stationary source emissions from the electrowinning cell, regeneration kiln, induction furnace, autoclaves and retort; and fugitive gaseous Hg emissions from the tailings storage facility (TSF), waste rock facility, open pit, and ore stockpile would only occur at the mine site. Fugitive dust particulate Hg emissions would occur at the mine site from wind erosion of exposed surfaces, traffic on unpaved roads, and ore transportation and processing (Environ 2015).

3.8.3.1 AIR QUALITY IMPACTS ANALYSIS METHODOLOGY

The Project Area is the footprint of the mine site, transportation facilities, and the pipeline. The emissions from the Project Area are described as direct emissions. The EIS Analysis Area is the larger geographical area that would experience indirect impacts, and is described in the impact analysis for each component. Indirect emissions are not quantified in this EIS.

Expected air quality impacts due to the Donlin Gold Project are evaluated based on the results of dispersion modeling (if available) and emissions estimates. Criteria for assessing air quality impacts are based on impact categories of magnitude or intensity, duration, geographic extent, and context. The guideline criteria used to assess the project's potential direct and indirect impacts on air quality are provided in Table 3.8-14.

Table 3.8-14: Air Quality Impact Assessment Criteria

Impact Category	Effects Summary		
Magnitude or Intensity	**Low:** Emissions are below air quality permit thresholds, or impacts meet regulatory standards.	NA	**High:** Regulatory standards; mitigation measures are not effective.
Duration	**Temporary:** Air quality would be reduced infrequently, but not longer than the span of the project construction and would be expected to return to pre-activity levels at the completion of the activity.	**Long-term:** Air quality would be reduced from the end of project construction through the life of the mine, and up to 100 years.	**Permanent:** Air quality would be reduced and would not be anticipated to return to previous levels.
Geographic Extent	**Local:** Affects air quality only locally; discrete portions of the Project Area affected.	**Regional:** Affects air quality beyond a local area, potentially throughout the EIS Analysis Area or outside the Project Area.	**Extended:** Affects air quality beyond the regional scale.
Context	**Common:** Affects attainment/unclassified[b] areas.	**Important:** Affects maintenance[b] areas or areas with local air quality standards.	**Unique:** Affects Class I areas or poor air quality (EPA non-attainment[b] areas).

Notes:
a Air permit thresholds are shown in Table 3.8-15.
b Refer to Section 3.8.1.2 and Table 3.8-2 for descriptions of air quality attainment and maintenance areas.
NA = Not applicable

Emissions were quantified for Alternative 2; impacts to air quality from other action alternatives are discussed qualitatively in relation to Alternative 2 in Sections 3.8.3.4 through 3.8.3.8. Additionally, impacts associated with all alternatives are compared in Table 3.8-33.

Air quality permit thresholds for PSD permits, Title V permits, and minor permits are shown in Table 3.8-15. For the Donlin Gold Project, only emissions from stationary sources count toward permit applicability.

Table 3.8-15: Air Quality Permit Thresholds

Permit Type	CO (tpy)	NO_x (tpy)	$PM_{2.5}$ (tpy)	PM_{10} (tpy)	SO_2 (tpy)	VOC (tpy)	HAPs (tpy)
PSD							
Major Source Threshold	250	250	250	250	250	250	250
Significant Emission Rate	100	40	10	15	40	40	NA
Title V							
New Major Source Threshold	100	100	100	100	100	100	10/25[b]
Minor Permit							
New Minor Source Threshold	NA	40	15	15	40	NA	NA

Notes:
CO = Carbon monoxide
HAPs = Hazardous air pollutants
NO_x = Oxides of nitrogen
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively
SO_2 = Sulfur dioxide
VOC = Volatile organic compound
Source: ADEC 2015a

Except for a small portion of the pipeline (which would primarily emit GHGs) located near Denali National Park, the proposed project is not located near a Class I area. No components of the project would be located within or near a non-attainment, maintenance, or area with local regulations. Therefore, the context would be common for all components and phases.

The following common assumptions and approaches were used to estimate emissions for the air quality impact analyses:

- natural gas fuel sulfur content is 15 ppm;
- diesel-fired equipment uses ULSD;
- for the construction phase of all components, mobile construction equipment emissions are based on expected equipment types and usage factors provided by Donlin Gold (Fernandez 2014f); and
- fugitive dust generated from wind erosion of exposed surfaces is based on maximum acreage of disturbed area in a year for a given phase.

Note that, although neither mobile source nor fugitive emissions are counted for permit applicability, their impacts are included in the ambient impact analysis.

3.8.3.2 ALTERNATIVE 1 – NO ACTION

Under the No Action Alternative, the proposed Donlin Gold Project would not be undertaken and the required permits would not be issued. Existing ambient air quality, as it reflects current activities and conditions described in the Affected Environment section, would remain the same. Consequently, no new direct or indirect effects on air quality would occur from the implementation of the No Action Alternative.

3.8.3.3 ALTERNATIVE 2 – DONLIN GOLD'S PROPOSED ACTION

3.8.3.3.1 MINE SITE

For analysis purposes, the Project Area and the EIS Analysis Area for the mine site are both the lease area boundary.

Construction

The construction phase of the mine site would last 3 to 4 years (SRK 2012a), and thus would be considered of temporary duration. Activities consist of initial pioneering and development of pits to be mined, including the construction of mining facilities, milling facilities, TSF, waste rock facilities, overburden storage facilities, haul roads, and support infrastructure. There will be an incinerator or open pit burning at the mine site during construction (Enos 2015b). Emissions were not provided in the construction phase emission calculations provided by Donlin Gold (Air Sciences, Inc. 2014a). All activities and impacts occur at the mine site; therefore, the geographic extent would be local.

Direct impacts to air quality during this phase would be caused by air emissions from fugitive and mobile sources; the estimated emissions are summarized in Table 3.8-16.

Table 3.8-16: Mine Site Construction Phase Emissions[d]

Emissions Source	CO (tons)	NO_x (tons)	$PM_{2.5}$ (tons)	PM_{10} (tons)	SO_2 (tons)	VOC (tons)	HAPs (tons)	Hg[c] (tons)	CO_2-e (tons)
Fugitive[a]	152.0	4.1	107.9	758.1	0.0	0.0	2.6849	0.0019	459
Mobile[b]	1,033.7	510.8	8.9	8.9	1.9	97.3	1.8949	0.0000	196,739
Total	**1,186**	**515**	**117**	**767**	**2**	**97**	**4.5798**	**0.0019**	**197,198**

Notes:

a Fugitive sources consist of disturbed areas subject to wind erosion, material handling, drilling, roads, dozing and grading, blasting, and crushing (SRK 2012f; Air Sciences Inc. 2014c). Estimates assume 90 percent control efficiency applied to dust generated from unpaved roads due to vehicle miles traveled (VMT) and 80 percent control efficiency to dust generated by flat surfaces exposed to wind erosion. No controls applied to dust generated by material handling, crushing, or dozing and grading (Cardno 2015a, b).

b Mobile sources consist of tailpipe emissions from construction equipment and personnel transport equipment (Fernandez 2014f, Air Sciences, Inc. 2014c; Cardno 2015a, b).

c Hg is also included under HAPs.

d The emissions in this table cover the entire construction phase.

CO = Carbon monoxide

CO_2-e = Carbon dioxide equivalent

HAPs = Hazardous air pollutants

Hg = Mercury

NO_x = Oxides of nitrogen

$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively

SO_2 = Sulfur dioxide

VOC = Volatile organic compounds

Source: Air Sciences, Inc. 2014c; Cardno 2015a, b; Fernandez 2014f; SRK 2012f.

There would be no emitting units classified as stationary sources during the construction phase. Thus, air emissions would not exceed permit thresholds[15] and impacts would meet regulatory standards; thus, the air quality impact magnitude would be considered low.

Indirect air quality impacts associated with the construction phase of the mine site would result from emissions associated with transporting supplies and construction materials to the mine site. These impacts are discussed under the transportation facilities section.

Operations and Maintenance

The operations and maintenance phase of the mine site would last 25 to 30 years, thus would be considered of long-term duration. Activities include extracting the ore from the ground and processing it to produce gold doré bars. The processing steps include crushing, grinding, flotation, pressure oxidation, cyanide leaching, gold refining, cyanide detoxification, and discharging tailings to the TSF. Under Alternative 2, Donlin Gold would use a conventional slurry disposal method within a lined TSF in the Anaconda Valley (SRK 2012a). Maintenance activities would include routine and preventive maintenance of support facilities and infrastructure (such as mine roads, landfill trenches, and other associated mining facilities) in the area of the mine site. Some reclamation activities would occur during the mine operations phase, in areas that are no longer required for active mining. These activities occur at the mine site so would be considered local in extent.

Table 3.8-17 shows a list of stationary fuel combustion emission units at the mine site during operations, with their respective typical fuel.

Table 3.8-17: Mine Site Stationary Emission Units during Operations Phase

ID	Description	Fuel	Typical Fuel
W1 to 12	Power plant generators (12)	Natural Gas/ULSD[a]	99% natural gas and 1% diesel
BEDG1 & 2	Black start generators (2)	ULSD	ULSD
CEDG1 to 4	Emergency generators (2)	ULSD	ULSD
FP1 to 3	Fire pumps (3)	ULSD	ULSD
17-BLR-301 & 302	POX boilers (2)	Natural Gas/ULSD[b]	Natural Gas
17-BLR-001	Oxygen plant boiler	Natural Gas/ULSD[b]	Natural Gas
56-BLR-200	Carbon elution heater	Natural Gas/ULSD[b]	Natural Gas
PP-HEU-100 & 200	Power plant auxiliary boilers (2)	Natural Gas/ULSD[b]	Natural Gas
15-BRN-100	SO_2 burner	Natural Gas	Natural Gas
1-15-BRN-100	Auxiliary SO_2 boiler	ULSD	ULSD
81-HEU-1 to 138	Building heaters (138)	Natural Gas	Natural Gas

[15] Stationary source emission thresholds for PSD permit, Title V permit, and minor permit applicability are shown in Table 3.8-15.

Table 3.8-17: Mine Site Stationary Emission Units during Operations Phase

ID	Description	Fuel	Typical Fuel
81-HVA-104 to 109, 111 to 113, 119, 126, 127, 201 to 207, 220, 231 to 234, 253, 257	Air handlers (26)	Natural Gas	Natural Gas
PBH1 to 20	Portable heaters (20)	ULSD	ULSD

Notes:
a Worst case fuel for power plant generators is ULSD for CO, NO_x, PM, SO_2, VOC, and CO_2-e.
b Worst case fuel for boilers is natural gas for NO_x and ULSD for CO, PM, SO_2, VOC, and CO_2-e.
ULSD = Ultra low sulfur diesel

Source: Air Sciences, Inc. 2015b.

Mercury emissions would be released into the atmosphere at the mine site during the operation and maintenance phase. Sources include the following (SRK 2014a):

- Open Pit Mine, Ore, and Waste Rock – Gaseous mercury emissions may be released to the air due to volatilization of weathered sulfide minerals when exposed to the environment. Mercury has a low volatilization temperature, so will form a gas at ambient temperatures, as well as at the higher temperatures that occur during gold processing. These sources may also generate particle bound Hg as wind-blown dust.
- Ore Processing – Mercury may be released into atmosphere during crushing and grinding as fugitive dust. Gaseous Hg would be produced during the pressure oxidation, carbon reactivation, electrowinning, retort, and refining stages. The gaseous Hg from the point sources would be collected and treated prior to release to the atmosphere, such that only 0.4 percent of the Hg passing through the mill would be released into the atmosphere (Hatch 2014).
- TSF – Mercury would be present in the TSF in an inorganic solid form. However, releases to air from TSF could occur as fugitive gaseous emissions through volatilization and as fugitive particle bound emissions in wind-blown dust.
- Fugitive Dust – Mercury emissions would occur as fugitive dust due to mining operations such as drilling, blasting, loading, ore crushing, wind erosion of exposed surfaces, and road use.

Emissions of Hg from the natural gas power plant are expected to be negligible (EPA 2014a).

Direct impacts to air quality during this phase would be caused by air emissions from fugitive, mobile, and stationary sources; the estimated emissions are summarized in Table 3.8-18.

The operations emissions presented in Table 3.8-18 are based on AP-42 emission factors, performance data from similar sources, manufacturer specifications, new source performance standards (NSPS), and technical literature (Air Sciences, Inc. 2015b; Cardno 2015a, b). In addition:

- Mill operations, power generation, and ancillary equipment (including incinerators) emissions are based on maximum design rates.
- Combustion source emissions assume typical fuel as shown in Table 3.8-17.

- The main power plant generators operate with selective catalytic reduction to control NO_x and an oxidation catalyst to control CO; and emissions limitations in 40 CFR Part 60, Subpart IIII.
- The autoclaves and carbon process with retort are subject to mercury emission limit 40 CFR Part 63, Subpart EEEEEEE. The controls would be expected to outperform these standards (Hatch 2014). Mercury abatement would occur at each major thermal source, including the autoclave, carbon kiln, gold furnaces, and retort (SRK 2012a).

As shown in Table 3.8-18, CO_2-e emissions from mine site operations are 1,760,469 tpy. This converts to 1,597,469 MT per year; therefore, the project would be subject to the GHG reporting rule described in Section 3.8.1.3.1.

Table 3.8-18: Annual Mine Site Operations Phase Emissions

Emissions Source	CO (tpy)	NO_x (tpy)	$PM_{2.5}$ (tpy)	PM_{10} (tpy)	SO_2 (tpy)	VOC (tpy)	HAPs (tpy)	Hg[d] (tpy)	CO_2-e (tpy)
Fugitive[a]	1,377.3	37.0	163.7	1,257.8	0.1	0.0	4.0686	0.0391	327,631
Mobile[b]	2,043.8	1,979.1	22.9	22.9	3.9	110.9	3.9204	0.0000	408,761
Stationary[c]	1,126.0	350.6	332.3	349.0	16.7	538.3	18.5806	0.3182	1,024,077
Total	**4,547**	**2,367**	**518**	**1,630**	**21**	**649**	**26.5696**	**0.3574**	**1,760,469**

Notes:

a Fugitive sources consist of drilling, blasting, ore loading (in-pit), ore unloading (short term stockpile), ore unloading (long-term stockpile), waste loading, waste unloading, ore hauling, waste hauling, dozer use, grader use, water truck use, tailings beach (dry), haul roads, waste dump, short-term ore stockpile, long-term ore stockpile, long-term ore stockpile west, long-term ore stock pile east (Air Sciences Inc. 2015b; Cardno 2015a, b) and GHGs from dewatered wetlands (Cardno 2015b). During operations, 90 percent control efficiency was applied to fugitive dust generated from unpaved roads (haul roads and access roads), material handling (ore and waste), maintenance equipment (dozers, graders, water trucks). No controls applied to the fugitive emissions resulting from drilling, blasting, or wind erosion of the tailings beach.

b Mobile sources consist of hydraulic shovels, front-end loaders, haul trucks, drills, track dozers, wheel dozers, graders, water trucks, hydraulic excavators, fuel trucks, service trucks, mobile cranes, low boy trucks, tire handlers, and light plants (Air Sciences Inc. 2015b; Cardno 2015a, b).

c Stationary sources consist of power plant generators (12), black start generators (2), emergency generators (4), fire pumps (2), POX boilers (2), oxygen plant boiler, carbon elution heater, power plant auxiliary boilers (2), SO_2 burner, auxiliary SO_2 burner, building heaters (138), air handlers (26), portable heaters (20), ROM ore discharge and crushing, coarse ore transfer, pebble crushers and stockpile, reagents handling, and mixing, refinery sources, laboratories, water treatment plant, camp waste incinerator, sewage sludge incinerator, mine site tanks, and power plant tanks (Air Sciences Inc. 2015b; Cardno 2015a, b).

d Hg is also included under HAPs.

CO = Carbon monoxide
CO_2-e = Carbon dioxide equivalent
Hg = Mercury
HAPs = Hazardous air pollutants
NO_x = Oxides of nitrogen
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively
POX = Pressure oxidation
SO_2 = Sulfur dioxide
ROM = Run of mine
tpy = tons per year
VOC = Volatile organic compounds

Sources: Air Sciences Inc. 2015b; Cardno 2015a, b.

Air Quality Control Permit

Donlin Gold is required to obtain air quality control permits from the ADEC for mine site operations. Fugitive and mobile source emissions do not count for permit applicability. For the purpose of this EIS, the emission calculations for all combustion emission units at the mine site in Table 3.8-18 are based on natural gas usage to the extent possible, as that is the fuel expected to be used for Alternative 2. However, for PSD NSR, minor NSR and Title V permit applicability, PTE is estimated using the fuel that yields the highest emissions (i.e., worst-case) allowed by the permit. As Alternative 2 includes the option of using diesel fuel in the dual fuel-fired equipment as a contingency measure, it should be accounted for in determining permit applicability. Table 3.8-19 shows mine site stationary source emissions assuming the highest emitting fuel is used in dual-fuel fired equipment. For criteria pollutants the highest emitting fuel is usually, but not always, ULSD.[16]

Table 3.8-19: Annual Mine Site Stationary Operations Phase Emissions for Permit Applicability

Emissions Source	CO (tpy)	NO_x (tpy)	$PM_{2.5}$ (tpy)	PM_{10} (tpy)	SO_2 (tpy)	VOC (tpy)	HAPs (tpy)
Stationary[a]	1,256	1,225	367	384	23	1,168	18.4
PSD Major Source Threshold	250	250	250	250	250	250	250
Significant Emission Rate	100	40	10	15	40	40	NA
PSD Permit Triggered?	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**No**
Title V Major Source Threshold	100	100	100	100	100	100	10/25[b]
Title V Permit Triggered?	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**No**
Minor Source Threshold	NA	40	15	15	40	NA	NA
Minor Permit Triggered?[c]	**NA**	**No**	**No**	**No**	**No**	**NA**	**NA**

Notes:

a Stationary sources consist of power plant generators (12), airport generators (2), black start generators (2), emergency generators (4), fire pumps (3), ROM ore discharge and crushing, coarse ore transfer, pebble crushers and recycle, reagents handling and mixing, refinery sources, laboratories, water treatment plant, POX boilers (2), oxygen plant boiler, carbon elution heater, power plant auxiliary boilers, SO_2 burner, auxiliary SO_2 burner, building heaters (138), air handlers (26), portable heaters (20), camp waste incinerator, sewage sludge incinerator, mine site tanks, power plant tanks, airport tanks, and camp site tanks. The HAP emission rate also includes fugitive sources (Air Sciences Inc. 2015b).

b A source is major for Title V if it emits 10 tpy of any individual HAP or 25 tpy or more of any combination of HAPs, including fugitive emissions.

c No minor source permit is required because the project will obtain a PSD major source permit.

HAPs = Hazardous air pollutants
CO = Carbon monoxide
NA = Not applicable
NO_x = Oxides of nitrogen
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively
POX = Pressure oxidation
PSD = Prevention of significant deterioration
ROM = Run-of-mine
SO_2 = Sulfur dioxide
tpy = Tons per year
VOC = Volatile organic compounds

Sources: Air Sciences Inc. 2015b; ADEC 2015a.

Emissions of CO, NO_x, $PM_{2.5}$, PM_{10} and VOCs exceed PSD thresholds, making this a PSD major source for these pollutants. The project is also major for O_3, because it is major for both NO_x and VOC. The PSD permit process would require Donlin Gold to perform an air quality impact analysis to ensure compliance with air quality standards and increments in 18 AAC 50.010 and 18 AAC 50.020. The permit would also require BACT on emission units to minimize air pollution.

16 The highest emitting fuel varies depending on pollutant and combustion unit type. Table 3.8-17 provides information on the worst-case fuel for the dual fuel-fired stationary combustion equipment.

This mine site would be located 220 miles from the Tuxedni Wilderness Class I area,[17] and 188 miles from the nearest border of Denali National Park Class I area, therefore no notification to the NPS would be required by regulation. The closest distance of any Class I area to any part of the project is 4.4 miles [Denali National Park to the natural gas pipeline], but the pipeline would not have operating emissions. NPS was notified about the project, and indicated that no Class I area analysis would be required (Air Sciences Inc. 2014a, 2015b). However, NPS requested an evaluation of project effects on the Lake Clark National Park and the Katmai National Park and Preserve (both Class II areas) (Air Sciences Inc. 2014a).

Air Sciences Inc. 2015b includes additional impact analyses of project impacts on soil, vegetation, and visibility in the EIS Analysis Area, which is designated as Class II. Donlin Gold's assessment of project impacts on soils and vegetation is based on the ambient demonstration results that demonstrate compliance with the primary AAQS for CO, NO_2, $PM_{2.5}$ and PM_{10}. Because the project complies with primary standards, it would also comply with secondary standards. Secondary standards were designed to protect public welfare, including prevention of damage to vegetation (Air Sciences Inc. 2015b).

For visibility impacts, Donlin Gold conducted a visibility analysis using EPA's visibility impairment screening model VISCREEN (version 13190) (Air Sciences, Inc. 2015b). They conducted the analyses for an observer at Crooked Creek Airport and Sleetmute Airport, based on total PM emissions from the project point sources. The results of this screening analysis indicate that a plume could potentially be visible from these locations 9 percent and 1 percent of the time, respectively. The actual percentage of time that a plume could be visible would likely be less than cited, as this was a screening analysis assuming worst-case conditions (Air Sciences Inc. 2015b).

To show that there would not be adverse impacts at Lake Clark or Katmai National Parks, Donlin Gold conducted an ambient analysis for CO, NO_2, $PM_{2.5}$, PM_{10}, and SO_2 using AERMOD. The analysis showed compliance with the primary AAQS at both locations, indicating compliance with the secondary standards (Air Sciences, Inc. 2015b). Again, because the project complies with primary standards, it would also comply with secondary standards.

The mine site would also trigger Title V permitting. A complete Title V permit application would be required no later than 12 months after the date on which the mine site becomes subject to AS 46.14.120(b) (i.e., within 12 months after commencement of operation of a major source). The CAM Rule would be applicable to the project approximately 5 years after startup.

No minor permits are triggered (a minor permit is not required for a new facility that requires a PSD permit per 18 AAC 50.502(a)(1)) (ADEC 2015a).

Ambient Impacts

Donlin Gold prepared an air quality impact analysis to show compliance with air quality standards and increments for PSD permitting as part of their air quality control permit application, and also to support the EIS. The analysis was conducted using the AMS/EPA Regulatory Model (AERMOD) version 14134, which is recommended by EPA. For this analysis, Donlin Gold incorporated data from AERMAP (version 11103), the terrain preprocessor; AERMET (version 14134), the meteorological preprocessor; and surface characteristics from a

[17] Class I areas, as they pertain to air quality, are described in Section 3.8.1.2

tool based on AERSURFACE developed by Air Sciences, Inc. specifically for Alaska (Air Sciences, Inc. 2015b). The analysis covers all PSD pollutants. The ambient analysis uses the highest emitting fuel (worst-case) assumptions described under Air Quality Control Permit above. In addition, the modeling analysis accounts for mining activities and mobile machinery, as shown in Table 3.8-20. Donlin Gold used 5 years of ADEC-approved site specific meteorological data as input to the ambient analysis to show compliance with the AAAQS. This surface meteorological data was collected at the American Ridge station from July 1, 2005 to June 30, 2010 (Air Sciences, Inc. 2015b). Upper air data was from the McGrath NWS COOP Site. The modeling accounts for depletion of PM into the ambient air due to settling; however, the deposition to the ground was not estimated.

Increment modeling results are shown in Table 3.8-21. AAAQS dispersion modeling results are shown in Table 3.8-22.

The ambient analysis, including meteorological data used in support of the analysis, would be reviewed in detail by ADEC during the air quality application review process. ADEC would present its findings on data adequacy in the permit technical analysis report.

As shown on Figure 3.8-3, the maximum PSD increment impacts are located either right on or very close to Donlin Gold's ambient air boundary.

Table 3.8-20: Annual Mine Site Operations Phase Modeled Emissions

Emissions Source	CO (tpy)	NO_x (tpy)	$PM_{2.5}$ (tpy)	PM_{10} (tpy)	SO_2 (tpy)	VOC (tpy)
Stationary[a]	1,256	1,225	367	384	23	1,168
Fugitive[b]	1,380	38	166	1,321	0	0
Mobile[c]	2,042	1,978	23	22	4	111
Total	**4,678**	**3,241**	**556**	**1,727**	**27**	**1,279**

Notes:

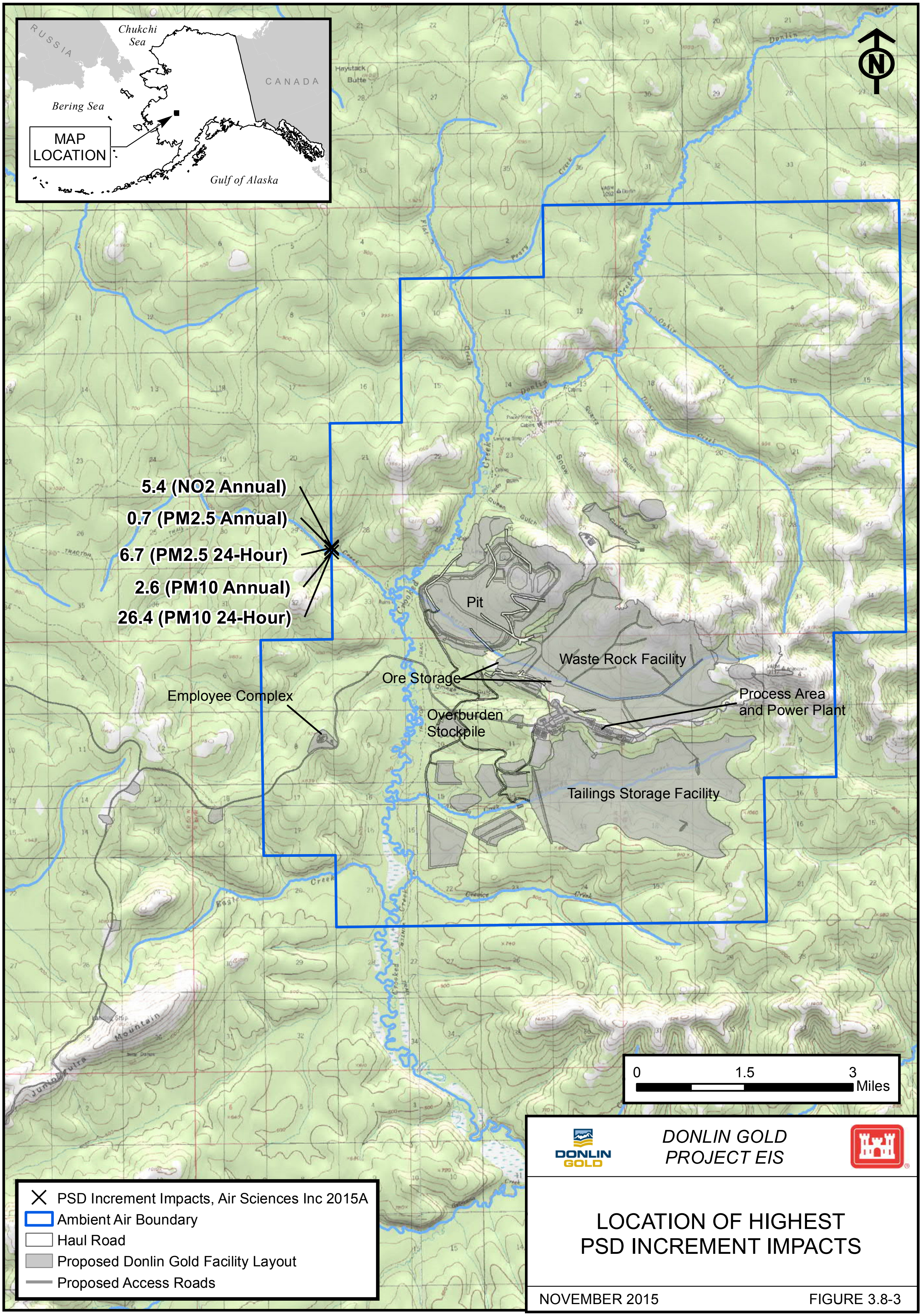
a Stationary sources consist of power plant generators (12), airport generators (2), black start generators (2), emergency generators (4), fire pumps (3), ROM ore discharge and crushing, coarse ore transfer, pebble crushers and recycle, reagents handling and mixing, refinery sources, laboratories, water treatment plant, POX boilers (2), oxygen plant boiler, carbon elution heater, power plant auxiliary boilers, SO_2 burner, auxiliary SO_2 burner, building heaters (138), air handlers (26), portable heaters (20), camp waste incinerator, sewage sludge incinerator, mine site tanks, power plant tanks, airport tanks, and camp site tanks.

b Fugitive emissions are a result of mining activities consisting of drilling, blasting, material handling (ore handling (in-pit), ore loading and unloading, waste loading and unloading, ore and waste hauling), maintenance equipment (dozers, graders, water trucks), wind erosion of exposed surfaces (tailings beach, haul roads, access roads, waste dump, and stockpiles). During operations, 90% control efficiency was applied to fugitive dust generated from unpaved roads (haul roads and access roads), material handling (ore and waste), maintenance equipment (dozers, graders, water trucks). No controls applied to the fugitive emissions resulting from drilling, blasting, or wind erosion of the tailings beach.

c Mobile machinery consists of hydraulic shovels, front-end loaders, haul trucks, drills, track dozers, wheel dozers, graders, water trucks, hydraulic excavators, fuel trucks, service trucks, mobile cranes, low boy trucks, tire handlers and light plants.

CO = Carbon monoxide
HAPs = Hazardous air pollutants
NO_x = Oxides of nitrogen
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrrometers, respectively.
POX = Pressure oxidation
ROM = Run of mine
SO_2 = Sulfur dioxide
tpy – Tons per year
VOC = Volatile organic compounds

Source: Air Sciences Inc. 2015b.



DONLIN GOLD PROJECT EIS

LOCATION OF HIGHEST PSD INCREMENT IMPACTS

NOVEMBER 2015

FIGURE 3.8-3

Table 3.8-21: PSD Increment Dispersion Modeling Results

Pollutant	Averaging Period	Maximum Impact ($\mu g/m^3$)	PSD Increment ($\mu g/m^3$)	Percent of Increment (%)
NO_2	Annual	5.4	25	21.6
$PM_{2.5}$	Annual	0.7	4	18.0
	24-Hour (2nd high)	6.7	9	74.4
PM_{10}	Annual	2.6	17	15.3
	24-Hour (2nd high)	26.4	30	88.0

Notes:
% = Percent
NO_2 = Nitrogen dioxide
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively.
PSD = Prevention of significant deterioration
$\mu g/m^3$ = micrograms per cubic meter

Source: Air Sciences, Inc. 2015b.

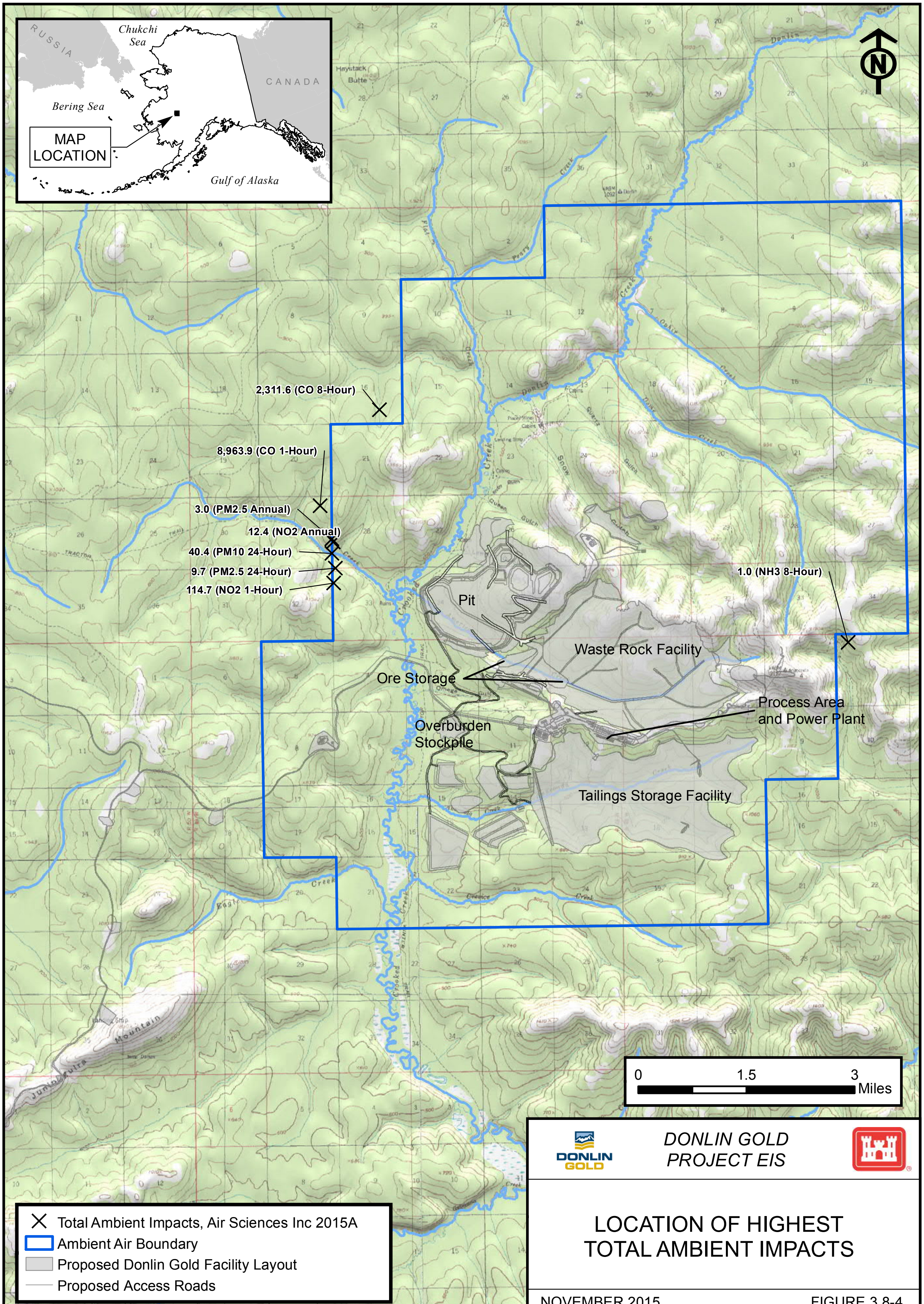
Table 3.8-22: AAAQS Dispersion Modeling Results

Pollutant	Averaging Period	Maximum Impact ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	NAAQS and AAAQS ($\mu g/m^3$)	Percent of Standard (%)
CO	8-Hour (2nd high)	1,853.6	457.9	2,311.5	10,000	23.1
	1-Hour (2nd high)	8,277.0	686.9	8,963.9	40,000	22.4
NO_2	Annual	12.4	(included)	12.4	100	12.4
	1-Hour (8th high)	114.7	(included)	114.7	188	61.0
$PM_{2.5}$	Annual	0.7	2.3	3.0	12	25.0
	24-Hour (8th high)	2.9	6.8	9.7	35	27.7
PM_{10}	24-Hour (2nd high)	26.4	14.0	40.4	150	26.9

Notes:
% = Percent
CO = Carbon monoxide
na = Not available
NAAQS/AAAQS = National/Alaska Ambient Air Quality Standards
NO_2 = Nitrogen dioxide
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively
VOC = Volatile Organic Compounds
$\mu g/m^3$ = micrograms per cubic meter

Source: Air Sciences, Inc. 2015b.

As shown on Figure 3.8-4, the maximum total ambient impacts are located either right on or very close to Donlin Gold's ambient air boundary.



DONLIN GOLD

DONLIN GOLD PROJECT EIS

LOCATION OF HIGHEST TOTAL AMBIENT IMPACTS

NOVEMBER 2015

FIGURE 3.8-4

The tables show that the project would comply with AAAQS and PSD increments for the highest emitting fuel. (As described in Section 3.8.1.1.1, the AAAQS are generally the same as the NAAQS, as they cannot be less stringent. Thus, compliance with the AAAQS ensures compliance with the NAAQS.) Because all dual fuel-fired equipment would be primarily fired on natural gas for Alternative 2, the modeling is conservative. Although the emissions are above air quality permit thresholds, the impacts comply with AAAQS and NAAQS, therefore magnitude of air quality impacts during the operation and maintenance phase would be considered low.

Following recent EPA guidance (EPA 2014g) on assessing the ambient impacts of secondary $PM_{2.5}$, Air Sciences Inc. (2015b) determined that no additional evaluation of secondary $PM_{2.5}$ is necessary to conclude that secondary $PM_{2.5}$ from the project will not cause or contribute to a violation of the $PM_{2.5}$ standard or increment.

To estimate O_3 impacts, Air Sciences Inc. (2015b) conducted a qualitative analysis of O_3 concentrations. Air Sciences Inc. compared total NOx and VOC emissions in the Anchorage area to the total emissions from the project. From Table 3.8-20, project maximum NOx emissions are 3,241 tpy and maximum total VOC emissions are 1,279 tpy, for a total of 4,520 tpy. As indicated in Air Sciences Inc. (2015b), this is only 17 percent of the combined Anchorage-area NO_x and VOC emissions of 26,594 tpy for 2002. Anchorage monitoring data from 2010 to 2012 indicates that ambient O_3 is 45 ppb, well below the 75 ppb 8-hour O_3 standard. Because the project NO_x plus VOC emissions are less than Anchorage-area NO_x plus VOC emissions and the Anchorage area is in compliance with the O_3 standard, it is expected that the project would also not cause or contribute to a violation of the O_3 standard.

For mercury deposition impacts, Environ conducted local-scale ambient air mercury modeling for the project using CALPUFF (Environ 2015). The model provides predictions of ambient mercury concentrations (and wet and dry deposition) to show impacts of stationary and fugitive sources of mercury in the Project Area. Donlin Gold used meteorological data for 2008 from the Weather Research and Forecast model, with a grid resolution of 4 km (Environ 2012). Mercury concentrations were estimated at discrete and gridded receptors in the Project Area (Crooked Creek and Aniak).

Table 3.8-23 shows the ambient air modeling results for Hg^0 for comparison to EPA and World Health Organization (WHO) guidelines. The maximum modeled impact is less than 1 percent of the guidelines shown.

Table 3.8-23: Mercury Ambient Modeling Results Estimated Using CALPUFF

Guideline Authority	Guideline Type	Time Period	Guideline Limit	Observed Baseline at Camp (Hg^0)	Maximum Modeled Concentration due to Stack and Fugitive Sources (Hg^0)	Total (Hg^0)	Percent of Guideline (%)
EPA[a]	Chronic Inhalation Exposure	Annual Average	0.3 µg/m³	0.0014 µg/m³	0.00027 µg/m³	0.00167 µg/m³	0.56
WHO[b]	No observed adverse effect	Annual Average	0.2 µg/m³	0.0014 µg/m³	0.000075 µg/m³	0.00167 µg/m³	0.84
EPA[c]	Acute Inhalation Exposure	Max 1-hr	1.7 mg/m³	0.000002 mg/m³	0.000075 mg/m³	0.000077 mg/m³	0.0045

Notes:
a EPA Integrated Risk Information System (IRIS) (EPA 2014b).
b World Health Organization (WHO 2003).
c EPA Acute exposure guideline levels for mercury vapor (EPA 2010b).

Hg^0 = Elemental Hg vapor, also known as gaseous elemental Hg
µg/m³ = microgram per cubic meter
mg/m³ = milligram per cubic meter
Source: EPA 2010b, 2014b; WHO 2003; Environ 2015.

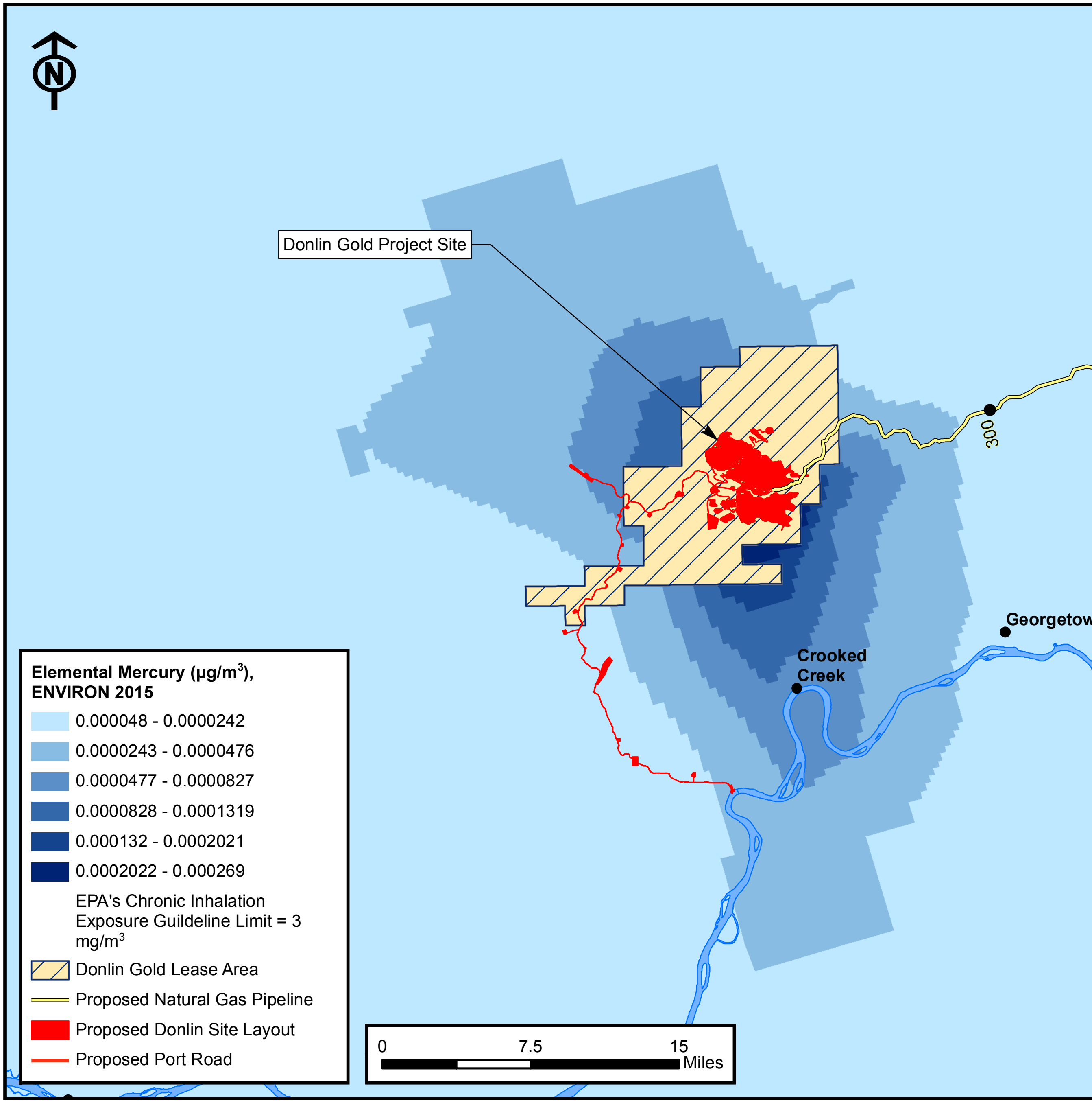
The geographic distribution of predicted ambient air concentrations of annual average Hg^0 and 1-hour peak Hg^0 from the stack and fugitive sources at the mine site are shown on Figure 3.8-5 and Figure 3.8-6, respectively. Note that the units representing the ambient Hg concentrations are different for the two figures.

Table 3.8-24 shows the project's predicted stationary source (due to stacks) and fugitive Hg deposition based on CALPUFF modeling results. The maximum annual predicted contribution from the project's stack and fugitive sources is 4.7 µg/m². Baseline deposition is 8.4 µg/m²; the project's sources could increase deposition by up to 56 percent in some areas (Environ 2013, 2015). There are no standards or guidelines for Hg deposition.

Table 3.8-24: Annual Maximum Mercury Deposition Modeling Results estimated using CALPUFF

Location	Hg^0, Hg^{II}, and Hg_p Deposition due to Stacks (µg/m²)	Hg^0 and Hg_p Deposition due to Fugitives (µg/m²)	Maximum Total Hg Deposition due to All Sources (µg/m²)
Eta – Crooked Creek	0.5	4.2	4.7

Notes:
Hg^0 = Elemental Hg vapor, also known as gaseous elemental Hg
Hg^{II} = Gaseous divalent Hg, also known as gaseous oxidized mercury or reactive gaseous Hg
Hg_p = Particle bound Hg
µg/m² = microgram per square meter
Source: Environ 2015.

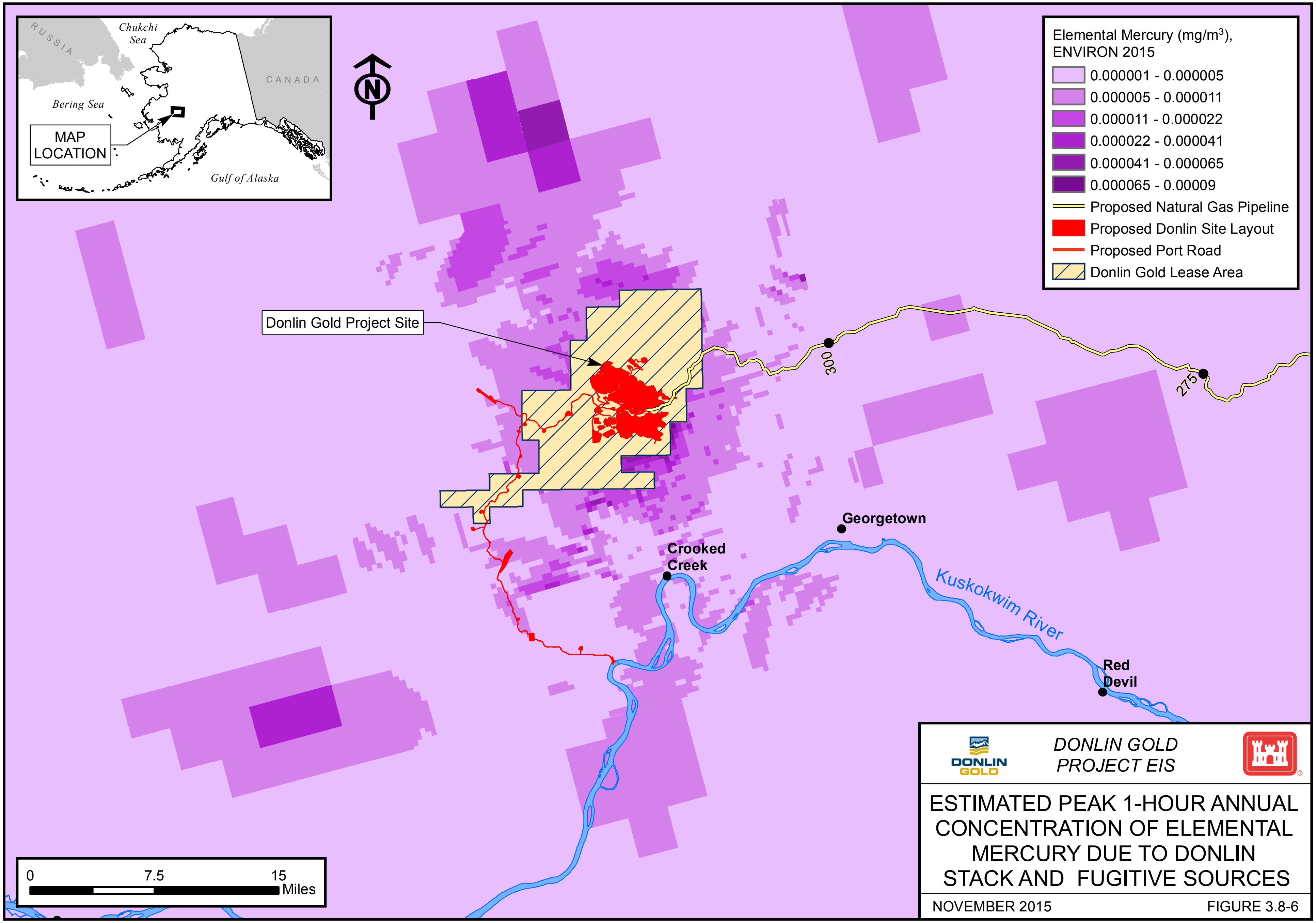


DONLIN GOLD PROJECT EIS

ESTIMATED ANNUAL AVERAGE CONCENTRATION OF ELEMENTAL MERCURY DUE TO DONLIN STACK AND FUGITIVE SOURCES

NOVEMBER 2015

FIGURE 3.8-5



DONLIN GOLD PROJECT EIS

ESTIMATED PEAK 1-HOUR ANNUAL CONCENTRATION OF ELEMENTAL MERCURY DUE TO DONLIN STACK AND FUGITIVE SOURCES

NOVEMBER 2015

FIGURE 3.8-6

The geographic distribution of predicted concentrations of annual total Hg deposition flux from the stack and fugitive sources at the mine site are shown on Figure 3.8-7.

The different forms of Hg (Hg^0, Hg^{II}, and Hg_p) have different chemical and physical characteristics, which affect their deposition rates (Environ 2015).

EPA (2014a) indicates that natural gas power plants have negligible Hg emissions; therefore, the project's incremental Hg emissions would largely be a result of mining activities.

Indirect air quality impacts associated with the operation and maintenance phase of the mine site would result from emissions associated with transporting supplies and construction materials to the mine site. These impacts would be associated with the transportation facilities.

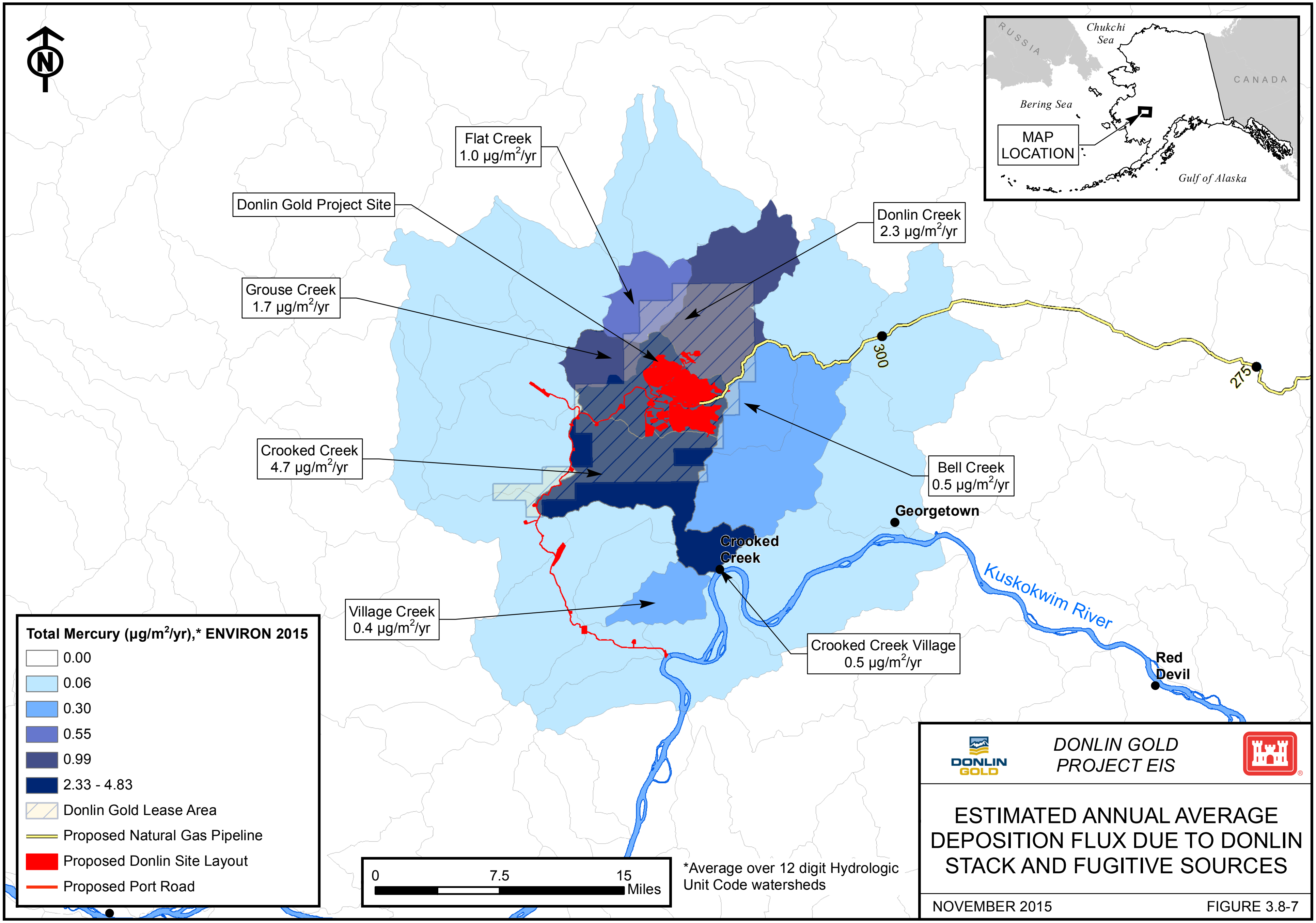
Closure, Reclamation, and Monitoring

Donlin Gold's goals for reclamation of the mine site during and after operations include shaping, vegetating, and stabilizing the land for post-reclamation land use (SRK 2012f). Some reclamation activities would occur concurrently with project activities during the operation and maintenance phase, thus mitigating impacts during that phase.

Closure and reclamation activities such as reclaiming roads (although some roads would remain for post-reclamation monitoring); backfilling the pit and stabilizing pit highwalls; grading, contouring and restoring the WRF; covering the tailings impoundment; and removing material, equipment, and buildings would require considerable grading including soil amendments and revegetation as necessary. These activities would continue for a period of 5 years after operations cease (SRK 2012f), thus would be of long-term duration.

Post-reclamation monitoring activities would continue beyond this timeframe. For example, one small generator would remain at the mine site to operate the post-reclamation water treatment plant until such time as the discharge meets water quality standards, and the airstrip would remain as a long term facility. Additional post-reclamation phase emissions would result from vehicle traffic on unpaved roads due to monitoring activities at the open pit, TSF, and WRF (SRK 2012c). These impacts would last longer than 4 years and would occur at the mine site, so would be considered long-term in duration, and local in extent.

Direct impacts to air quality would be caused by air emissions from fugitive, mobile, and stationary sources; the estimated emissions are summarized in Table 3.8-25 during the closure phase.



DONLIN GOLD PROJECT EIS

ESTIMATED ANNUAL AVERAGE DEPOSITION FLUX DUE TO DONLIN STACK AND FUGITIVE SOURCES

NOVEMBER 2015

FIGURE 3.8-7

Table 3.8-25: Maximum Annual Mine Site Closure Phase Emissions

Emissions Source	CO (tpy)	NO_x (tpy)	$PM_{2.5}$ (tpy)	PM_{10} (tpy)	SO_2 (tpy)	VOC (tpy)	HAPs (tpy)	Hg[d] (tpy)	CO_2-e (tpy)
Fugitive[a]	0.0	0.0	39.5	263.6	0.0	0.0	0.4701	0.0003	0
Mobile[b]	966.6	758.9	9.7	9.7	0.3	52.5	1.8543	0.0000	192,403
Stationary[c]	9.3	1.1	0.1	0.1	0.0	0.5	0.1028	0.0000	1,850
Total	**976**	**760**	**49**	**273**	**0**	**53**	**2.4271**	**0.0003**	**194,253**

Notes:

a Fugitive sources consist of disturbed areas subject to wind erosion, assuming exposed surface derived from waste material composite sample and 80 percent control efficiency. Fugitive dust from vehicle traffic on unpaved roads is not included (Rieser 2014d).

b Mobile sources consist of front-end loaders (8), water truck (2), hydraulic excavators (4), drill rigs (1), track dozers (8), graders (2), mobile cranes (5), low boy truck (4), and backhoes (4), assuming 8,760 hours per year usage (Fernandez 2014f). Tailpipe emissions from vehicle traffic are not included (Rieser 2014d).

c Stationary sources consist of one 275 kW generator (Rieser 2014e).

d Hg is also included under HAPs.

CO = Carbon monoxide
CO_2-e = Carbon dioxide equivalent
HAPs = Hazardous air pollutants
Hg = Mercury
NO_x = Oxides of nitrogen
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively
SO_2 = Sulfur dioxide
tpy = Tons per year
VOC = Volatile organic compounds

Source: Fernandez 2014f; Rieser 2014d, e; Air Sciences, Inc. 2015b; Cardno 2015b.

Mine site emissions during the closure and reclamation phase would be below air quality permit thresholds, and would meet regulatory standards; thus, the magnitude of the impacts would be considered low.

There would also be indirect air quality impacts associated with the closure phase of the mine site because transportation of supplies and employees would still occur. These impacts would be associated with the transportation facilities component through occasional barge, aircraft, or vehicle use during closure.

Summary of Mine Site Impacts

Impacts to air quality would be of low intensity (below permit thresholds, with impacts meeting regulatory standards) for the construction and closure phases and medium intensity (above permit thresholds but meeting regulatory standards) during the operations phase. The duration of impacts would be temporary during the construction and closure and reclamation phases (not longer than 4 years), but there would be long-term impacts (through life of project) during mine site operations and for mine site post-reclamation activities. All impacts would be considered local in extent because effects would occur in the Project Area. The context would be considered common, as the location is in an attainment/unclassified area. Therefore, impacts are considered to be minor.

3.8.3.3.2 TRANSPORTATION FACILITIES

The Project Area for the transportation facilities is the ROW width of the roads, the property boundary of the Angyaruaq (Jungjuk) Port, the area of the Bethel Port expansion, the airstrip property boundary (and up to 3,000 feet in altitude), and the bank width of the river. Impacts occurring within the Project Area are considered direct impacts. The EIS Analysis Area includes the airport of origin and flight path for air traffic; for water transportation the EIS Analysis Area includes the existing Bethel Port, the Dutch Harbor Port and the ocean traffic lane from the Aleutian chain to Bethel. Impacts in the EIS Analysis Area are considered indirect impacts.

Construction of transportation facilities subcomponents is estimated to occur in the first year of the project, and impacts would be temporary in duration. All transportation facilities would be operational through the life of the project, thus would be considered long-term in duration.

Emissions of Hg are not expected to be of concern for the transportation facilities component, as no ore would be handled. However, lead would likely be emitted from the use of aviation gasoline (avgas) in aircraft.

Land and Air Transportation

Fuel and general cargo would be transported by road from the Angyaruaq (Jungjuk) Port site to the mine site on the Angyaruaq (Jungjuk) mine access road. As shown on Figure 2.3-12 (Chapter 2, Alternatives), the mine access road would be a 30-mile, 2-lane, 30-foot wide, all-season gravel road starting at the mine and ending at the Angyaruaq (Jungjuk) Port site near the mouth of Jungjuk Creek. There would be a 3-mile long spur road that connects the proposed airstrip to the mine access road. The mine camp facilities would be located on the mine access road. Use of these roads would be limited to mine support traffic; public use would not be allowed (SRK 2013a). Fuel would be transported using a fleet of 13,500-gallon capacity B-train tanker trucks, and general cargo using a fleet of B-train tractor-trailer units (SRK 2013a).

The transportation facilities would also include a 5,000-foot by 150-foot gravel airstrip located approximately 9 miles west of the mine site. Two 200-kW diesel generators would be located at the airstrip, along with two 9,900-gallon storage tanks (containing Jet "A" fuel and avgas, respectively), and a 5,000-gallon diesel storage tank). The airstrip would be used for transportation of personnel, perishable goods, and emergency re-supply of cargo goods (SRK 2013a).

The proposed 21-acre Angyaruaq (Jungjuk) Port site, located near the mouth of Jungjuk Creek would serve as a main terminal for river barges from the Bethel Port and a transfer point for cargo going to the mine site. Facilities would include barge berths; barge ramp; container handling equipment; seasonal storage for containers, break bulk cargo and fuel; and barge-season office/lunchroom facilities. Electricity would be provided by two 1,200-kW diesel generators (one primary and one standby). The site would include a 252 horsepower emergency firepump, 2.8 Mgal storage tank for diesel fuel, a 25,000-gallon diesel fuel dispenser tank, a 25,000-gallon port equipment tank, and a 270-gallon fire pump tank (SRK 2013a; Fernandez 2013c).

The existing Bethel Port site would be used for fuel and material transport and storage. A new 16-acre cargo terminal; 3.5-acre infrastructure for buildings, access roads, and other support facilities; and additional 4 Mgal fuel storage site are proposed at the Bethel Port. During shipping season, the cargo and fuel terminals would operate full time (SRK 2013a).

The existing Dutch Harbor Port site is a forward deployment location used for cargo transport and fuel storage. About 8 Mgal of fuel storage would be constructed for the project. No other additional facilities would be constructed at the Dutch Harbor Port (SRK 2013a; AMEC 2013).

Construction

Construction activities would include clearing, grubbing, and earthwork for installation of the access roads, airstrip, and ports. Disturbed areas consist of the permanent camp, airstrip, material sites, mine access road, and the airport spur road. Emissions from open burning are not included in emissions estimates for facility construction because it is not expected to occur (Rieser 2014c). Reclamation of borrow pits is anticipated to occur concurrently with these activities, reducing the exposed area. The use of heavy equipment would be expected to result in fugitive dust and tailpipe emissions in the local vicinity of the activity. Air transportation during construction includes operation of fixed wing aircraft and rotary wing aircraft (helicopters) (Fernandez 2014f). Impacts from aircraft would result from combustion of fuel in the aircraft.

Direct impacts to air quality would be caused by fugitive and mobile sources; the estimated emissions are summarized in Table 3.8-26. Note that this table covers the entire construction phase. Direct impacts from aircraft consist of the emissions generated from landings and take-offs (LTOs) at the Donlin Gold airstrip only. An LTO cycle includes all normal operations performed by an aircraft between the time it descends through an altitude of 3,000 feet on its approach and the time it subsequently reaches the 3,000-foot altitude after takeoff (EMEP 2013). Note that direct impacts would also occur from expanding the Bethel Port; however, specific information on construction equipment is not available for the Bethel Port (Fernandez 2014f). The emissions that would be caused by expanding the existing Bethel Port by 3.5 acres were estimated by prorating the diesel machinery and windblown dust emissions that would be caused by construction of the new 21-acre Angyaruaq (Jungjuk) Port. The direct emissions expected from expanding the Bethel Port are included in Table 3.8-26.

Table 3.8-26: Land and Air Transportation Construction Phase Emissions

Emissions Source	CO (tons)	NO_x (tons)	$PM_{2.5}$ (tons)	PM_{10} (tons)	SO_2 (tons)	VOC (tons)	HAPs (tons)	Pb[c] (tons)	CO_2-e[d] (tons)
Fugitive[a]	19.7	0.5	152.5	1,396.0	0.0	0.0	4.4047	0.0538	0
Mobile[b]	1,314.2	226.2	8.1	8.1	4.7	83.1	3.2814	0.0156	301,482
Total	**1,334**	**227**	**161**	**1,404**	**5**	**83**	**7.6861**	**0.0694**	**301,482**

Notes:

a Fugitive sources consist of disturbed areas subject to wind erosion, material handling, drilling, vehicles traveling on roads, dozing and grading, and blasting (Air Sciences Inc. 2014a; Cardno 2015a, c). Estimates assume 90 percent control efficiency applied to dust generated from unpaved roads due to vehicle miles traveled (VMT) and 80 percent control efficiency to dust generated by flat surfaces exposed to wind erosion (SRK 2012f).

b Mobile sources consist of tailpipe emissions from construction equipment, fixed wing aircraft Dash 8 Q300 (27 flights per week), Twin Otter Series 400 (3 flights per day), and Cargo Plane (3 flights per 2 weeks); and helicopters (assumed 2 flight per day – local use only) (Air Sciences Inc. 2014a; Cardno 2015a, c; Fernandez 2014f).

c Pb is also included under HAPs.

d CO_2-e emissions calculated assuming 3 years of construction.

CO = Carbon monoxide
CO_2-e = Carbon dioxide equivalent
HAPs = Hazardous air pollutants
na = not available
NO_x = Oxides of nitrogen
Pb = Lead
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively.
SO_2 = Sulfur dioxide
tpy – tons per year
VOC = Volatile organic compounds

Source: Air Sciences Inc. 2014a; SRK 2012f; Fernandez 2014f; Tripod 2014; FAA 2009, 2012; Airlines Inform 2012; EPA 2009c, 2010c; EMEP 2013; CR 2014; Cardno 2015a, c.

There would be no emitting units classified as stationary sources during the construction phase. Air emissions would be below permit and impacts would meet regulatory standards; thus, the magnitude of the impacts would be considered low. The extent of land and air transportation facilities impacts would vary from local to regional during the construction phase.

Indirect air quality impacts associated with the construction phase would result from LTO and cruise operations for air traffic between Anchorage (or other point of origin) and the airstrip. Cruise operations are defined as all activities that take place above 3,000 feet, including climb from the end of climb-out in the LTO cycle to the cruise altitude, cruise and the descent from the cruise altitude to the start of the LTO operations of landing (EMEP 2013). There would be additional indirect air quality impacts associated with the construction phase of the Angyaruaq (Jungjuk) and Bethel ports, due to transportation of supplies and employees. There would also be indirect impacts associated with construction activities at Dutch Harbor Port.

Operations and Maintenance

During the operations and maintenance phase, the mine access road and airstrip access roads would be used as follows:

- Mine Access Road – transporting cargo and fuel and maintenance activities from Angyaruaq (Jungjuk) Port to the mine site using tanker trucks, container trucks, light vehicles, water trucks, and buses (Air Sciences, Inc. 2015a);
- Camp to Mine Site – transporting personnel and goods from the camp to mine site using the mine access road; vehicles would include buses, light vehicles, water trucks, and graders (Air Sciences, Inc. 2015b); and
- Airport to Camp – transporting personnel and goods from the camp to the airport using the mine access road and the airstrip road; vehicles would include buses, light vehicles, water trucks, and graders (Air Sciences, Inc. 2015a).

Air transportation during operations includes operation of fixed wing aircraft and helicopters (Fernandez 2014f). Impacts would result from fugitive dust due to wind erosion of the airstrip, combustion of fuel in the generators, and combustion of fuel in the aircraft

The Angyaruaq (Jungjuk) and Bethel ports would be used for cargo transportation during the 110-day, ice-free barging season. During the winter, activities would be limited to facilities maintenance via road to the mine site (SRK 2013a).

Direct impacts to air quality during this phase would be caused by air emissions from fugitive, mobile, and stationary sources; the estimated emissions are summarized in Table 3.8-27. Table 3.8-27 does not include Bethel Port direct emissions because data is not available.

Table 3.8-27: Annual Land and Air Transportation Operations Phase Emissions

Emissions Source	CO (tpy)	NO_x (tpy)	$PM_{2.5}$ (tpy)	PM_{10} (tpy)	SO_2 (tpy)	VOC (tpy)	HAPs (tpy)	Pb[d] (tpy)	CO_2-e (tpy)
Fugitive[a]	0.0	0.0	3.5	35.5	0.0	0.0	0.0000	0.0000	0
Mobile[b]	204.3	42.0	1.3	3.5	0.8	0.6	0.5050	0.0019	40,120
Stationary[c]	98.4	9.7	0.5	0.5	0.2	5.4	0.4489	0.0000	18,908
Total	**303**	**52**	**5**	**40**	**1**	**6**	**0.9539**	**0.0019**	**59,027**

Notes:

a Fugitive sources consist of disturbed areas subject to wind erosion, and vehicle traffic on unpaved roads (Air Sciences Inc. 2014a; Cardno 2015c). During operations, 90 percent control efficiency was applied to fugitive dust generated from unpaved roads (access roads). (SRK 2012f).

b Mobile sources consist of tailpipe emissions from buses, light weight vehicles, water trucks, graders, tanker trucks, and container trucks fixed wing aircraft Dash 8 Q300 (9 flights per week), Twin Otter Series 400 (1 flight per day), and Cargo Plane (1 flight per 2 weeks); and helicopters (1 flight per 4 days – local use only) and mobile harbor cranes (2), wheel-loader, forklift (5 ton), forklift (30 ton container handling) (4), pick-up (4x4) (6), container trailers (20), semi-trailer tractor (14), terminal tractors (4), highboy trailer, fuel truck (Air Sciences 2014a; Cardno 2015c; Fernandez 2014f).

c Stationary sources consist of airport generators (2 @ 200 kilowatt-electric) and fuel storage tanks; Angyaruaq (Jungjuk) Port generators (2 @ 1,200 kilowatt-electric), firepump (500 hours per year), and fuel storage tanks (Air Sciences Inc. 2015b; Cardno 2015c; Fernandez 2013c).

d Pb is also included under HAPs.

CO = Carbon monoxide
CO_2-e = Carbon dioxide equivalent
HAPs = Hazardous air pollutants
Pb = Lead
NO_x = Oxides of nitrogen
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively
SO_2 = Sulfur dioxide
tpy – Tons per year
VOC = Volatile organic compounds

Sources: Air Sciences Inc. 2014a; Cardno 2015c; SRK 2012f; Tripod 2014; FAA 2009, 2012; Airlines Inform 2012; EPA 2009d, 2010c; EMEP 2013

Emissions from the operations phase would be below permit thresholds[18] and impacts would meet regulatory standards; thus, the magnitude of impacts would be considered low.

Indirect air quality impacts associated with the operations phase would result from LTO and cruise operations for air traffic between Anchorage (or other point of origin) and the airstrip and cargo activities / fuel storage at the Dutch Harbor Port. There would be additional indirect air quality impacts associated with the operations phase of the Angyaruaq (Jungjuk) and Bethel ports, due to transportation of supplies and employees.

There are no direct impacts to air quality at the Dutch Harbor Port. Indirect impacts to air quality during this phase would be caused by air emissions from mobile and stationary sources.

The extent of land and air transportation facilities subcomponents impacts vary from local to regional during operations.

Closure, Reclamation, and Monitoring

The proposed access roads would be used for long-term monitoring at the mine site. The roads would not be reclaimed after mine operations cease, so there would be no impacts to air quality

[18] Stationary source emission thresholds for PSD permit, Title V permit, and minor permit applicability are shown in Table 3.8-15.

due to reclamation activities. The impacts due to monitoring activities would last for at least 50 years so would be long-term in duration, low in magnitude, and local in extent.

The Angyaruaq (Jungjuk) Port and proposed airstrip would be used for long-term monitoring at the mine site. The Angyaruaq (Jungjuk) Port would be partially reclaimed by removing sheet piles and fill and recontouring the area (SRK 2012f). This could result in short term emissions during these reclamation activities. The airstrip would not be reclaimed after mine operations cease, so there would be no impacts to air quality due to reclamation activities. The impacts due to monitoring activities[19] post-closure would last for at least 50 years, so would be considered long-term in duration, low in magnitude, and local in extent.

It is unlikely that the Bethel and Dutch Harbor port sites would be reclaimed upon project closure. Therefore, it is anticipated that no air quality impacts would occur due to project closure and reclamation activities for either site.

Water Transportation

The following sections describe direct impacts from river traffic as well as indirect impacts from ocean barge traffic. There would be an increase in ocean and river barge traffic from transporting cargo and fuel supplies during the mine site construction and operations phases.

Ocean barges would transport general cargo from Seattle, Washington, Vancouver, British Columbia, or Dutch Harbor to Bethel, and fuel from refineries in the Pacific Northwest to Dutch Harbor for storage and then to Bethel. Ocean barging could occur all year. For purposes of this EIS, ocean barging impacts are considered indirect impacts.

River barges transport the general cargo and fuel on the Kuskokwim River from Bethel to Angyaruaq (Jungjuk) Port. River barging could only occur during the ice-free season, assumed to be about 110 days (AMEC 2013). Impacts of river barges are considered to be direct impacts.

Construction

Construction phase activities would require river fuel barges (58 round trips annually for two sets of barges), river general cargo barges (64 round trips annually for two sets of barges), ocean fuel barges (10 round trips annually), and ocean general cargo barges (16 round trips annually) (Rieser 2014b, assuming construction phase river barging same as operations barging). Impacts would vary from local (Kuskokwim River) to regional in extent (ocean barging).

Direct impacts on air quality would be caused by air emissions from mobile sources; the estimated emissions are summarized in Table 3.8-28.

[19] Mine site monitoring of groundwater is described in Section 3.6.

Table 3.8-28: Annual River Traffic Construction Phase Emissions

Emissions Source	CO (tpy)	NO_x (tpy)	$PM_{2.5}$[b] (tpy)	PM_{10} (tpy)	SO_2[c] (tpy)	VOC (tpy)	HAPs[d] (tpy)	Pb[d] (tpy)	CO_2-e (tpy)
Mobile[a]	75.7	148.4	9.1	9.4	0.1	7.6	nc	nc	10,574
Total	76	148	9	9	0	10	nc	nc	10,574

Notes:
a Mobile sources consist of river barges (Cardno 2015c; AMEC 2013; Rieser 2014b).
b $PM_{2.5}$ EF is assumed 97% of PM_{10}.
c SO_2 EF is based on 1.5% diesel fuel sulfur content.
d HAPs and Pb emissions from barges not calculated, assumed impacts to be negligible due to low VOC emissions.
CO = Carbon monoxide
CO_2-e = Carbon dioxide equivalent
HAPs = Hazardous air pollutants
NO_x = Oxides of nitrogen
nc = Not calculated
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively
SO_2 = Sulfur dioxide
tpy = tons per year
VOC = Volatile organic compounds
Sources: Cardno 2015c; AMEC 2013; Rieser 2014b; EPA 2009c.

There would be no emitting units classified as stationary sources during the construction phase. Air emissions would not exceed permit thresholds[20] and impacts would meet regulatory standards; thus, the magnitude of the impacts would be considered low.

Indirect impacts would occur from ocean barging between Pacific Northwest to Dutch Harbor and Bethel.

The extent of water transportation facilities subcomponent impacts vary from local to regional during construction.

Operations and Maintenance

Operations and maintenance phase activities would require river fuel barges (58 round trips annually), river general cargo barges (64 round trips annually), ocean fuel barges (14 round trips annually), and ocean general cargo barges (12 round trips annually) (SRK 2013a; Rieser 2014b). Impacts would vary from local (river barging on Kuskokwim River) to regional in extent (ocean barging).

Direct impacts on air quality would be caused by air emissions from mobile sources as shown in Table 3.8-29.

[20] Stationary source emission threshold for PSD permit, Title V permit, and minor permit applicability are shown in Table 3.8-15.

Table 3.8-29: Annual River Traffic Operations Phase Emissions

Emissions Source	CO (tpy)	NO_x (tpy)	$PM_{2.5}$ (tpy)	PM_{10} (tpy)	SO_2 (tpy)	VOC (tpy)	HAPs[b] (tpy)	Pb[b] (tpy)	CO_2-e (tpy)
Mobile[a]	106.9	279.5	14.4	14.7	0.3	13.2	nc	nc	18,107
Total	107	280	14	15	0	13	nc	nc	18,107

Notes:
a Mobile sources consist of river barges (Cardno 2015c; AMEC 2013; Rieser 2014b.
b $PM_{2.5}$ EF is assumed 97% of PM_{10}.
c SO_2 EF is based on 1.5% diesel fuel sulfur content.
d HAPs and Pb emissions from barges not calculated, assumed negligible due to low VOC emissions.

CO = Carbon monoxide
HAPs = Hazardous air pollutants
nc = Not calculated
NO_x = Oxides of nitrogen
CO_2-e = Carbon dioxide equivalent
SO_2 = Sulfur dioxide
tpy = tons per year
VOC = Volatile organic compounds
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively

Source: Cardno 2014c; AMEC 2013; Rieser 2014b; EPA 2009d.

There would be no emitting units classified as stationary sources during the operations phase. Air emissions would not exceed permit thresholds and impacts would meet regulatory standards;[21] thus, the magnitude of the impacts would be considered low.

Indirect air quality impacts would result from the increased ocean traffic from various ports in the Pacific Northwest to Dutch Harbor and Bethel.

Closure and Reclamation

There would continue to be air quality impacts associated with ocean and river traffic as long as barging is used to provide supplies and fuel during closure and reclamation activities, for a duration of approximately 5 years (SRK 2012f).

Summary of Transportation Facilities Impacts

Impacts to air quality for all phases associated with the transportation facilities would be of low intensity (below permit thresholds, with impacts meeting regulatory standards). The duration of impacts would be temporary during the construction phase, but would be long-term (through life of project) during operations and closure phases. Impacts would range from local to regional in extent (e.g., increases in ocean and river barge traffic). Furthermore, the context would be considered common, as the location is in an attainment/unclassified area.

3.8.3.3.3 NATURAL GAS PIPELINE

The Project Area for the natural gas pipeline is the pipeline ROW width, the property boundary of the proposed compressor station, the proposed airstrip property boundary (and up to 3,000 feet in altitude), proposed barge landings on east and west sides of the Kuskokwim River, and boundary of improvements to the Beluga barge landing. The EIS Analysis Area includes the

[21] Stationary source emission threshold for PSD permit, Title V permit, and minor permit applicability are shown in Table 3.8-15.

airport of origin and flight path for air traffic, and the ocean traffic lane from Anchorage to Beluga.

For the natural gas pipeline, no specific HAPs are expected to be of concern for the air quality resource, as mercury would be for the mine site and lead would be for the transportation facilities. Criteria air pollutant, HAPs, and GHG emissions in tpy during construction and operations phases are shown in Table 3.8-30 and Table 3.8-31.

Table 3.8-30: Annual Pipeline Construction Phase Emissions

Emissions Source	CO (tpy)	NO_x (tpy)	$PM_{2.5}$ (tpy)	PM_{10} (tpy)	SO_2 (tpy)	VOC (tpy)	HAPs (tpy)	CO_2-e (tpy)
Fugitive[a]	0.0	0.0	60.4	507.5	0.0	0.0	1.8589	0
Mobile[b]	1,612.4	306.0	10.1	10.1	4.9	99.7	8.0965	258,343
Stationary[c]	0.0	0.7	0.6	0.6	0.0	0.0	1.3758	403
Total	**1,612**	**307**	**71**	**518**	**7**	**100**	**11.3312**	**258,746**

Notes:

a Fugitive sources consist of disturbed area subject to wind erosion and material handling, fugitive dust – roads, fugitive dust dozing and grading (SRK 2013b). Open burning is not included because it is assumed emissions would be negligible (Rieser 2014c). No data are available for blasting at this time; the need for blasting during project construction would be determined during final design (Cardno 2015d, e). Blasting emissions during construction are expected to be minimal. Assumes exposed surface derived from waste material composite sample and 0% control efficiency except for unpaved roads. Unpaved roads assumed to have 90 percent control efficiency from water/chemical application (SRK 2012f).

b Mobile sources consist of equipment used during ROW and civil construction (i.e., civil construction equipment, power generators, land and air transportation during ROW and ground preparation for both spreads [assumed to occur during 1st through 3rd year] and pipelaying, ground restoration and clean up (i.e., equipment used for construction and concurrent restoration activities during pipelaying stage. (Fernandez 2014f; Rieser 2014b; Cardno 2015d, e). Mobile sources also include emissions from drilling activities and one 1,500 kWe camp generator (Donlin Gold 2015d; Fernandez 2014f).

c Stationary sources consist of 2 camp incinerators (one for each spread -300 people each, 5 pounds of waste per person, and 8 hours operation per day) (Rieser 2014b; Cardno 2015d, e).

CO = Carbon monoxide
CO_2-e = Carbon dioxide equivalent
HAPs = Hazardous air pollutants
NO_x = Oxides of nitrogen
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively
SO_2 = Sulfur dioxide
tpy = Tons per year
VOC = Volatile organic compounds

Sources: SRK 2012f; Fernandez 2014f; Rieser 2014b, c; Cardno 2015d, e.

Table 3.8-31: Annual Pipeline Operations Phase Emissions

Emissions Source	CO (tpy)	NO_x (tpy)	$PM_{2.5}$ (tpy)	PM_{10} (tpy)	SO_2 (tpy)	VOC (tpy)	HAPs (tpy)	CO_2-e (tpy)
Fugitive[a]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9,863
Mobile[b]	0.7	0.5	0.0	0.0	0.0	0.0	0.0096	174
Total	0.7	0.5	0.0	0.0	0.0	0.0	0.0096	10,036

Notes:

a Fugitive sources consist of GHG emissions due to unintended leaks from valves and fittings of the pipeline and compressor station, and due to permafrost destruction (assumed to occur over the operations phase).

b Mobile sources consist of Wheeled Hydro Ax (2), Tracked Feller/Buncher (1) (Fernandez 2014f); fixed wing aircraft Twin Otter Series 400 (1 flight per day); and helicopters (2 flights per day – local use only) (Cardno 2015e; Fernandez 2014f).

CO = Carbon monoxide
CO_2-e = Carbon dioxide equivalent
HAPs = Hazardous air pollutants
NO_x = Oxides of nitrogen
$PM_{2.5}$ and PM_{10} = Particulate matter with an aerodynamic diameter less than or equal to 2.5 and 10 micrometers, respectively.
SO_2 = Sulfur dioxide
tpy = Tons per year
VOC = Volatile organic compounds

Source: Cardno 2015e; Fernandez 2014f; Tripod 2014; FAA 2009, 2012; Airlines Inform 2012; EMEP 2013; CR 2014; INGAA 2005; IPCC 2000.

Construction

Construction of the proposed natural gas pipeline would take place over a period of 3 to 4 years, thus it would be temporary in duration. During the first year, activities include ROW clearing; grading of access roads and shoofly roads; preparation of the compressor station site and campsites; camp construction; pipeline storage yard construction; airstrip development or upgrade; development of barge landings on the east and west sides of the Kuskokwim River at the pipeline crossing and material sites; and improvement of the Beluga barge landing (SRK 2013b). (The barge landing at the Bethel Port and Angyaruaq [Jungjuk] Port sites would be used during pipeline construction as well. Impacts from these activities are discussed above under transportation facilities.) During Year 2 through Year 3 or 4, the primary activity would be pipeline installation. Stabilization and reclamation of areas disturbed during construction (pipeline trench, material sites, campsites, temporary access roads, pipe storage yards and other temporary uses areas) would be addressed concurrently with pipeline installation in accordance with a Stabilization, Rehabilitation, and Reclamation Plan (SRK 2013b). Because pipeline construction moves through an area relatively quickly, air emissions typically would be considered localized, intermittent, and short term.

Concurrent reclamation would occur as soon as practicable for access roads (including the Kuskokwim east and west barge landings and access roads), temporary pipeline storage yards, campsites, and airstrips in accordance with an approved Stabilization, Rehabilitation, and Reclamation Plan (SRK 2013b). A portion of the Beluga Port would be maintained for storing material and equipment needed during operation and maintenance.

Direct impacts to air quality during this phase would be caused by air emissions from fugitive and mobile sources; the estimated emissions are summarized in Table 3.8-30. Note that these emissions would occur along entire pipeline length.

Although some open burning may occur in remote areas, air pollutant emissions from such open burning is expected to be minimal and would be conducted in accordance with an open burn approval as required by the ADEC (SRK 2013b; Rieser 2014c).

The construction phase emissions presented in Table 3.8-30 are based on the premise that work on the two pipeline construction spreads are estimated to last two winter seasons, and two or three summer construction seasons. The air emissions from stationary emission units during construction of the pipeline would not exceed permit thresholds[22] and impacts would meet regulatory standards; thus, the magnitude of the impacts would be considered low. The extent of pipeline facilities impacts vary from local to regional during construction. Indirect impacts would result from ocean barge emissions between Anchorage and Beluga.

Operations and Maintenance

The compressor station would be powered by electricity from Chugach Electric Association, Inc.'s Beluga power plant; therefore, it would not have combustion emissions. The pipeline components (compressor station, metering stations, mainline block valves, pipeline) would emit neither criteria pollutants nor substantial quantities of HAPs. However, there would be minor fugitive GHG emissions due to leaks from the compressor station, pipeline segments, valves and fittings. In addition, there would be some project-related maintenance activity along the pipeline such as vehicle and helicopter traffic (SRK 2013b). There would be no vented GHG emissions due to pipeline blowdown for planned maintenance (Rieser 2014a). There would be direct GHG emissions due to permafrost destruction and indirect emissions due to pipeline leakage between an assumed wellhead in Cook Inlet to Beluga.

Direct impacts to air quality during this phase would be caused by air emissions from fugitive and mobile sources; the estimated direct emissions are summarized in Table 3.8-31.

Emissions from the operations phase would be below permit thresholds[23] and impacts would meet regulatory standards, thus the magnitude of the impacts would be considered low.

Indirect air quality impacts associated with the operations phase of the natural gas pipeline component would occur at the Beluga power plant, due to the increase in electricity generation required to power the compressor station. The Beluga power plant is an existing source that currently operates under its own air quality permit. Increases in emissions would be subject to the ADEC review process, unless they are already accounted for in the existing permit. Because ADEC would not permit changes in emissions that would cause or contribute to a violation of the NAAQS or AAAQS, the magnitude would be low. Duration would be long-term (through life of project), geographic extent would be considered local to regional (upstream pipeline GHG emissions), and context would be common (would not affect any Class I or non-attainment area).

Closure and Reclamation

Reclamation at pipeline closure would be conducted in accordance with a Stabilization, Rehabilitation and Reclamation Plan (SRK 2013b). Activities would include removing all above-ground pipeline structures, signs and markers, and abandoning in place below grade and

[22] Stationary source emission thresholds for PSD permit, Title V permit, and minor permit applicability are shown in Table 3.8-15.

[23] Stationary source emission thresholds for PSD permit, Title V permit, and minor permit applicability are shown in Table 3.8-15.

horizontal directional drilling. Fiber optic cable would be abandoned in place. Roads and airstrips used for operations (if any) would be reclaimed. These activities would only require small hand tools used to cut aboveground sections of the pipeline (Fernandez 2014f). There would be continued fugitive GHG emissions from melting permafrost of about 24 tpy. Impacts to air quality due to pipeline reclamation activities are expected to be negligible.

Summary of Natural Gas Pipeline Impacts

Air quality impacts for all phases associated with the natural gas pipeline would be of low magnitude (below permit thresholds, with impacts meeting regulatory standards). The duration of impacts would be temporary during the construction phase (3 to 4 years), but would be long-term (through life of project) during the pipeline operations, and closure and reclamation phases. Impacts would range from local to regional in extent. Furthermore, the context would be considered common as the location is in an attainment / unclassified area.

3.8.3.3.4 DESIGN FEATURES

Under Alternative 2, the following design features proposed by Donlin Gold were considered when assessing air quality impacts:

- Comply with applicable state air quality regulations in 18 AAC 50, including open burning, fugitive dust, state emissions standards, construction and operating permit requirements.
- Comply with applicable federal requirements, including fuel sulfur, NSPS (40 CFR Part 60, Subparts A, Dc, LL, CCCC, IIII, JJJJ, and LLLL), and NESHAP (40 CFR Part 63, Subparts A, ZZZZ, EEEEEE, and CCCCCC) requirements.
- Use best management practices to minimize fugitive dust during construction and operations as necessary: limit traffic and disturbance of soil, where possible; stabilize and maintain stability of disturbed soil by spraying water, spreading snow, or applying another approved dust suppressant to attain 90 percent control (SRK 2013b).
- Use the following additional best practical methods to minimize fugitive dust: minimize disturbance of soil by phasing activities, refrain from blasting or drilling during meteorological conditions that would exacerbate dust production (Donlin Gold 2015f).
- Minimize area affected by project operations, and perform concurrent reclamation in areas not required for active mining (SRK 2012f; ARCADIS 2013a).
- At TSF dry beach, install silt fence, remove snow from active placement areas only (Donlin Gold 2014b).
- Use selective catalytic reduction to minimize NO_x emissions and an oxidation catalyst to minimize CO and organic compound emissions at the power plant (Air Sciences, Inc. 2015b).
- Use natural gas to fuel the power plant at the mine, rather than diesel.
- Use state of the art mercury abatement systems at the kiln feed and discharge, POX vent gas, and electrowinning cell fume hoods and gold refinery area, to comply with MACT regulations (SRK 2012a).

- Follow the post-closure reclamation plan (SRK 2012f).

3.8.3.3.5 CLIMATE CHANGE

Predicted overall increases in temperatures and precipitation and changes in the patterns of their distribution have the potential to influence the projected effects of the Donlin Gold Project on air quality. These effects are tied to changes in atmospheric conditions as discussed in Section 3.26.4.2.1, Climate Change.

3.8.3.3.6 SUMMARY OF IMPACTS FOR ALTERNATIVE 2

Impacts to air quality would be of low magnitude (below permit thresholds and meeting regulatory standards) for the construction and closure phases, and medium magnitude at the mine site during operations phase (above permit thresholds but meeting regulatory standards) (Table 3.8-32). The duration of impacts would be temporary during the construction phase, but would be considered long-term (through the life of the project) during operations and for post-reclamation activities. All impacts would be considered local in extent because effects would occur in the project vicinity. Furthermore, the context would be considered common as the location is in an attainment / unclassified area.

The overall effects of Alternative 2 on the air quality resource would be minor. There would be emissions above permit thresholds for the mine site during the operations phase, but the impact would not exceed ambient standards or increments.

Table 3.8-32: Alternative 2 Impact Levels by Project Component

Impact Type	Impact Level				
	Magnitude or Intensity	Duration	Geographic Extent	Context	Summary Impact[1]
Mine Site					
Project-related Air Quality Impact	Low	Temporary to Long-Term	Local	Common	
Summary	Low	Temporary to Long-Term	Local	Common	Minor
Transportation Facilities					
Project-related Air Quality Impact	Low	Temporary to Long-Term	Local to Regional	Common	
Summary	Low	Temporary to Long-Term	Local to Regional	Common	Minor
Pipeline					
Project-related Air Quality Impact	Low	Temporary to Long-Term	Local to Regional	Common	
Summary	Low	Temporary to Long-Term	Local to Regional	Common	Minor

Notes:
Stationary source emission thresholds for PSD permit, Title V permit, and minor permit applicability are shown in Table 3.8-15.
1 The summary impact rating accounts for impact reducing design features proposed by Donlin Gold and Standard Permit Conditions and BMPs that would be required. It does not account for additional mitigation measures the Corps is considering.

These effects determinations take into account impact reducing design features (Table 5.2-1 in Chapter 5, Impact Avoidance, Minimization, and Mitigation) proposed by Donlin Gold and also the Standard Permit Conditions and BMPs (Section 5.3, Chapter 5, Impact Avoidance, Minimization, and Mitigation) that would be implemented. Several examples of these are presented below.

Design features most important for reducing impacts to air quality include:

- The project design includes the use of natural gas to fuel the power plant and the other dual-fuel fired units at the mine site, which would result in lowering GHG emissions by 9.6031 MMT during the mine life of 27.5 years compared to diesel fuel;
- The project design includes use of selective catalytic reduction to minimize NO_x emissions at the power plant; and
- The project design includes the use of state-of-the-art mercury abatement systems at the kiln feed and discharge, pressure oxidation vent gas, and electrowinning cell fume hoods and gold refinery area, to comply with maximum achievable control technology regulations.

Standard Permit Conditions and BMPs most important for reducing impacts to air quality include:

- Use of BMPs such as watering and use of dust suppressants to control fugitive dust; and
- Compliance with Alaska Ambient Air Quality Standards (AAAQS).

3.8.3.3.7 ADDITIONAL MITIGATION AND MONITORING FOR ALTERNATIVE 2

While the Corps is considering additional mitigation and monitoring to reduce effects to other resources (Tables 5.5-1 and 5.7-1, Chapter 5, Impact Avoidance, Minimization, and Mitigation), no additional mitigation or monitoring measures have been identified to reduce effects to air quality. Thus, the summary impact rating for air quality would remain minor.

3.8.3.4 ALTERNATIVE 3A – REDUCED DIESEL BARGING: LNG-POWERED HAUL TRUCKS

Under Alternative 3A, Donlin Gold would use LNG instead of diesel to power the large haul trucks that would move waste rock and ore from the open pits during operations. These large trucks would account for approximately 75 percent of the total annual diesel consumption under Alternative 2. This alternative would affect the mine site and the transportation facilities components during the operations phase. Impacts to air quality during the construction and closure phases would be similar to those described under Alternative 2.

Under Alternative 3A, an LNG Plant, LNG storage tanks, and LNG distribution system would be located at the mine site in an area that would be disturbed under Alternative 2.

During the operations phase, there would be a reduction in consumption of diesel, compared to Alternative 2, thus less diesel storage would be needed. The consumption of natural gas would be increased.

There would be no vented emissions from the LNG storage tanks. Fugitive emissions are assumed to be negligible (Fernandez 2013c). This would reduce HAPs (a subset of VOC) emissions by about 8 percent, but would not affect Hg (a subset of HAPs) emissions. Emissions of CO, NO_x, PM, SO_2, VOCs, and CO_2-e at the mine site would decrease compared to Alternative 2.

For the transportation facilities component under Alternative 3A, there would be fewer ocean and river barge trips and less tanker truck traffic compared to Alternative 2. No additional fuel storage capacity would be required at the Dutch Harbor Port and the fuel storage capacity required at Bethel and Angyaruaq (Jungjuk) ports would be reduced or eliminated. Emissions of CO, NO_x, PM, SO_2, VOCs, and CO_2-e at the mine site would decrease compared to Alternative 2. Using LNG in the trucks instead of diesel would result in lower emissions of all pollutants at the mine site, and at the land and water transportation subcomponents during the operation and maintenance phase. This would not affect the magnitude of emissions (emissions from mobile sources are not considered in permit applicability, but emissions would exceed permit thresholds, as in Alternative 2). The duration of impacts would remain long-term (through life of mine), the extent local (affecting the mine site), and the context common (would not affect a Class I, non-attainment, or maintenance area, or area with local regulations). Impacts associated with climate change would be the same as those discussed for Alternative 2. Overall, the direct and indirect effects of Alternative 3A would be minor.

The effects determinations take into account applicable impact reducing design features, as discussed in Alternative 2. No additional mitigation or monitoring measures have been identified to reduce effects to air quality.

3.8.3.5 ALTERNATIVE 3B – REDUCED DIESEL BARGING: DIESEL PIPELINE

Under Alternative 3B, Donlin Gold would use a diesel pipeline to provide fuel to the mine's power generation facilities and mobile vehicle fleet, thereby eliminating barging of diesel fuel on the Kuskokwim River. This alternative would entail:

- construction and operations of an additional 18-mile diesel pipeline segment connecting the diesel fuel source at Tyonek to the proposed diesel pipeline;
- expansion of the existing Tyonek North Foreland Barge Facility;
- construction of a new Operations Center and Pumping Facility containing meters, pumps and a pig launcher, and a tank farm to store a 1 month supply of diesel fuel; and
- construction of living quarters and spill containment systems (Michael Baker, Jr. Inc. 2013a).

The diesel pipeline alternative would involve similar heavy equipment utilization and activities undertaken during the construction and closure phases described in Alternative 2 for the natural gas pipeline. The only variation would be the air quality impacts generated from the construction of an additional 18 miles of diesel pipeline segment and associated above-ground facilities for the diesel pipeline. However, some of these impacts would be offset by not building the natural gas pipeline compressor station and other natural gas above-ground facilities, or the diesel storage capacity at the Dutch Harbor, Bethel and Angyaruaq (Jungjuk) ports.

During the operations phase, Alternative 3B would affect the mine site, transportation facilities, and pipeline components.

At the mine site, dual fuel-fired equipment would be powered by diesel instead of natural gas. Emissions of NOx, CO, PM, SO_2, and GHGs would increase, and emissions of VOCs would decrease. Mercury emissions would increase compared to Alternative 2 due to use of diesel in the dual fuel-fired boilers. This would not affect the magnitude of emissions as defined in Table 3.8-14 (emissions are above permit thresholds, and compliance with the ambient standards was demonstrated assuming highest emitting fuel). The duration would be considered long-term (through the life of the mine), the extent would be local (affecting the mine site), and the context would be considered common (would not affect a Class I, non-attainment, or maintenance area, or area with local regulations). The overall impact would be minor at the mine site, as in Alternative 2.

For the transportation facilities, there would be no barging of fuel on the Kuskokwim (although barging would still be needed for other supplies), increased barging (along with tug boats) of diesel in Cook Inlet, and new or expanded port facilities with diesel storage, as compared to Alternative 2. There would be no transportation of diesel fuel on the mine access road. Fuel deliveries would occur year round. Fuel storage at the mine site would be reduced from Alternative 2 levels. Impacts from the air transportation subcomponent would be similar to Alternative 2.

Emissions of all criteria pollutants and GHGs from the transportation facilities as a whole would decrease, but could be offset by emissions from increased use of diesel fuel in other transportation facilities-related combustion equipment at the mine site. This would not affect the magnitude of emissions (emissions would be below permit thresholds). The duration would be considered long-term (through the life of the mine), the extent would be local (affecting the transportation facilities only), and the context would be considered common (would not affect a Class I, non-attainment, or maintenance area, or an area with local regulations). The overall impact would be minor associated with transportation facilities, similar to Alternative 2.

For the diesel pipeline component, there would be no compressor station. However, there would be an Operations Center and Pumping Facility, and 10 million gallons of diesel storage would be added at Tyonek.

During the construction phase, temporary emissions of criteria pollutants and GHGs are estimated to increase by about 6 percent due to construction of the additional 18-mile diesel pipeline. During the operations phase, fugitive GHG emissions from the diesel pipeline would be less compared to that of natural gas pipeline under Alternative 2. This would not affect the magnitude of emissions (emissions would be below permit thresholds). The duration of impacts would be considered long-term (through the life of the mine) and the extent would be local (affecting the pipeline). Even though the diesel pipeline would come close to a Class I area, there are negligible emissions; thus, common context (would not affect a Class I, non-attainment, or maintenance area, or area with local regulations). Impacts associated with climate change would be the same as those discussed for Alternative 2. Overall, the direct and indirect effects of Alternative 3B would be considered minor.

The effects determinations take into account applicable impact reducing design features, as discussed in Alternative 2. No additional mitigation or monitoring measures have been identified to reduce effects to air quality.

3.8.3.6 ALTERNATIVE 4 – BIRCH TREE CROSSING (BTC) PORT

Under Alternative 4, the upriver port site would be located at the BTC Port site rather than Angyaruaq (Jungjuk) Port site. This alternative would reduce the barge distance for freight and diesel out of Bethel bound for the mine site by about 69 river miles. However, a longer 76-mile access road (BTC Road) between the BTC Port site and the mine site would be used for transporting fuel and cargo for the project. The stationary emissions (power generation) would not change. This alternative would affect only the transportation facilities component (land and water) during the construction and operations phases. For both phases, the increase in overall emissions due to the longer road would be largely offset by the reduced barging emissions.

Criteria air pollutants and GHG emissions due to the 76-mile BTC Road during construction and operations are expected to increase about three times compared to the Alternative 2 30-mile mine access road. However, stationary source emissions would remain similar to Alternative 2. The emissions during construction would be temporary, and during operations would be long-term (through the life of the mine), the extent would be local (affecting the mine site), and context would be common (would not affect a Class I, non-attainment, or maintenance area, or area with local regulations). Impacts associated with climate change would be the same as those discussed for Alternative 2. The direct and indirect effects of Alternative 4 would be minor.

The effects determinations take into account applicable impact reducing design features, as discussed in Alternative 2. No additional mitigation or monitoring measures have been identified to reduce effects to air quality.

3.8.3.7 ALTERNATIVE 5A – DRY STACK TAILINGS

Under Alternative 5A, Donlin Gold would dispose of tailings in a dry stack TSF located in the Anaconda Creek valley. This would involve dewatering the tailings in a filter plant to produce filter cake. The filter cake would be transported by heated bed[24] haul trucks to the TSF. Dozers, graders, and roller compactors would be used to move and spread material, and compact the tailings. At closure, a cover system would be placed over the TSF and flattened. A water treatment plant would be used to treat pit lake water post-closure (BGC 2014a).

This alternative would affect the mine site during the operations and closure phases. The additional use of mobile machinery for transport and dewatering at the filter plant would increase mobile emissions, exposure of the dry stack surface would increase fugitive emissions, and the increase in power consumption would cause an increase in stationary emissions from the power plant. The increase in fugitive emissions due to the dry stack would be offset by the elimination of fugitive dust emissions from the TSF beach area under Alternative 2. The total increase in $PM_{2.5}$ and PM_{10} emissions would be 2.9 percent and 8.3 percent, respectively (Air Sciences, Inc. 2015c). The increase in HAPs over Alternative 2 would be 0.0749 tpy, and the increase in mercury would be 0.0001 tpy (Cardno 2015b). The dry stack tailing would be trafficable so the closure cover would be easier to place. This alternative would also affect the transportation facilities component during the operations phase, as there would be a six percent increase in barge traffic compared to Alternative 2 (BGC 2014a).

[24] Heated truck beds would prevent the tailings from freezing to the truck beds during the winter.

Donlin Gold would mitigate impacts from fugitive dust by installing silt fence across the dry stack surface as a wind break, removing snow from active areas only, and using a tall oil dust suppressant (Donlin Gold 2014b).

A potential increase in stationary source emissions due to the increase in power consumption would not change permit applicability, as the emissions (except SO_2) are already above permit thresholds. The 3 percent increase in modeled emissions from the power plant is not expected to change results of the ambient analysis, which is for the entire source and had a maximum impact on an ambient standard or increment of 62.2 percent (for 24-hr $PM_{2.5}$ NAAQS). Furthermore, the modeling is based on diesel fueling of all of the dual fuel-fired units, as diesel is the highest emitting fuel for all modeled pollutants.

Using the dry stack instead of conventional slurry would result in increased emissions at the mine site and transportation facilities during the operations phase. This would not affect the magnitude of emissions (emissions already exceed permit thresholds and compliance with standards and increments was demonstrated). The duration would be considered long-term (throughout the life of the mine), extent would be local (affecting the mine site and transportation facilities), and context would be common (would not affect a Class I, non-attainment, or maintenance area, or area with local regulations). Impacts associated with climate change would be the same as those discussed for Alternative 2. The overall direct and indirect effects of Alternative 5A would be minor.

The effects determinations take into account applicable impact reducing design features, as discussed in Alternative 2. No additional mitigation or monitoring measures have been identified to reduce effects to air quality.

3.8.3.8 ALTERNATIVE 6A – MODIFIED NATURAL GAS PIPELINE ALIGNMENT: DALZELL GORGE ROUTE

Alternative 6A would realign the natural gas pipeline to the Dalzell Gorge Route (MP 106.5 to MP 152.7). This action would not cause a substantial change in air emissions in any of the phases or project components from those identified under Alternative 2. Impacts associated with climate change would also be the same as those discussed for Alternative 2. Overall impacts to air quality associated with Alternative 6A would be minor.

The effects determinations take into account applicable impact reducing design features, as discussed in Alternative 2. No additional mitigation or monitoring measures have been identified to reduce effects to air quality.

3.8.3.9 IMPACT COMPARISON – ALL ALTERNATIVES

A comparison of the air quality impacts by component associated with each alternative is presented in Table 3.8-33.

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Table 3.8-33: Comparison of Impacts by Alternative*

Impact - causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Mine Site						
Construction	Direct impacts to air quality during this phase would result from fugitive and mobile sources. Air emissions would not exceed permit thresholds, and impacts would meet regulatory standards during this phase.	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2
Operations and Maintenance	Direct impacts to air quality during this phase would result from fugitive, stationary, and mobile sources. Mercury emissions would be released from the open pit, ore, and waste rock (volitization of weathered sulfide minerals); ore processing and other mining operations (emitted as fugitive dust); from the TSF. The gaseous mercury from the point sources would be collected and treated, such that only 0.4 percent of the mercury passing through the mine would	Similar to Alternative 2, with the following differences: There would be a reduction in the consumption of diesel, and less diesel storage would be required. Consumption of natural gas would be increased. There would be no vented emissions from the LNG storage tanks, which would reduce HAPs emissions by approximately 8 percent. Emissions of carbon monoxide,	Similar to Alternative 2, with the following differences: Emissions of NO_x, CO, PM, SO_2, and GHGs would increase, and emissions of VOCs would decrease. Mercury emissions would increase compared to Alternative 2 due to use of diesel in the dual fuel-fired boilers, but would still be within permitting and regulatory	Similar to Alternative 2	Similar to Alternative 2, with the following differences: The additional use of mobile machinery for transport and dewatering at the filter plant would increase mobile emissions, exposure of the dry stack surface would increase fugitive emissions, and the increase in power consumption would cause an increase in stationary emissions from the power plant. The increase in	Similar to Alternative 2

Table 3.8-33: Comparison of Impacts by Alternative*

Impact - causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Operations and Maintenance continued	be released into the atmosphere. Emissions during mine site operations would be above air quality permit thresholds; however, impacts comply with AAAQS and NAAQS, and PSD increments for the highest emitting fuel.	nitrogen oxides, particulate matter, sulfur dioxide, volatile organic compounds, and CO_2-e at the mine site would decrease compared to Alternative 2.	thresholds.		fugitive emissions due to the dry stack would be offset by the elimination of fugitive dust emissions from the TSF beach area under Alternative 2. Permitting and regulatory thresholds would still be met.	
Closure and Reclamation	Direct impacts to air quality during this phase would result from fugitive, stationary, and mobile sources. Air emissions would not exceed permit thresholds, and impacts would meet regulatory standards during this phase.	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2
Summary Impact Conclusion	Minor. Air pollutant emissions would meet regulatory standards.	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2

Table 3.8-33: Comparison of Impacts by Alternative*

Impact - causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Transportation Facilities						
Construction	Direct impacts to air quality during this phase would result from fugitive and mobile sources associated with land, air, and water transportation. Air emissions would not exceed permit thresholds, and impacts would meet regulatory standards during this phase.	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2, with the following differences: Criteria air pollutants and GHG emissions along the roadway are expected to increase about 3 times compared to Alternative 2. The increase in emissions due to the longer road would be largely offset by the reduced barging emissions. Permitting and regulatory thresholds would still be met.	Similar to Alternative 2	Similar to Alternative 2

Table 3.8-33: Comparison of Impacts by Alternative*

Impact - causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Operations and Maintenance	Direct impacts to air quality during operations and maintenance activities would result from fugitive, stationary, and mobile sources. Air emissions would not exceed permit thresholds, and impacts would meet regulatory standards during this phase.	Similar to Alternative 2, with the following differences: Using LNG haul trucks would result in lower emissions of all pollutants during this phase.	Similar to Alternative 2, with the following differences: Emissions of all criteria pollutants and GHGs from water transportation would decrease, but could be offset by emissions from increased use of diesel fuel in other transportation facilities-related combustion equipment at the mine site. Permitting and regulatory thresholds would still be met.	Similar to Alternative 2, with the following differences: Criteria air pollutants and GHG emissions are expected to increase about 3 times compared to Alternative 2. The increase in emissions due to the longer road would be largely offset by the reduced barging emissions. Permitting and regulatory thresholds would still be met.	Similar to Alternative 2, except there would be a six percent increase in cargo barge traffic compared to Alternative 2. Permitting and regulatory thresholds would still be met.	Similar to Alternative 2

Table 3.8-33: Comparison of Impacts by Alternative*

Impact - causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Closure and Reclamation	Direct impacts to air quality during closure and reclamation activities would result from fugitive, stationary, and mobile sources. The proposed access roads, Angyaruaq (Jungjuk) Port, and airstrip would be used for long-term monitoring at the mine site and would not be reclaimed. Air emissions would not exceed permit thresholds, and impacts would meet regulatory standards during this phase.	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2
Summary Impact Conclusion	Minor. Air pollutant emissions would not exceed permit thresholds and impacts would meet the regulatory standards.	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2

Table 3.8-33: Comparison of Impacts by Alternative*

Impact - causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Pipeline						
Construction -	Direct impacts to air quality during this phase would result from fugitive, stationary, and mobile sources. Air emissions would not exceed permit thresholds, and impacts would meet regulatory standards during this phase.	Similar to Alternative 2	Similar to Alternative 2, with the following differences: Temporary emissions of criteria pollutants and GHGs are estimated to increase by about six percent due to construction of the additional 18-mile diesel pipeline. Permitting and regulatory thresholds would still be met.	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2
Operations and Maintenance	Direct impacts to air quality during this phase would result from fugitive and mobile sources. Air emissions would not exceed permit thresholds, and impacts would meet regulatory standards during this phase.	Similar to Alternative 2	Same as Alternative 2, with the following differences: Fugitive GHG emissions from the diesel pipeline would be less compared to that of natural gas pipeline under Alternative 2. Permitting and regulatory thresholds would still be met.	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2

Table 3.8-33: Comparison of Impacts by Alternative*

Impact - causing Project Component	Alt. 2 – Proposed Action	Alt. 3A – LNG-Powered Haul Trucks	Alt. 3B – Diesel Pipeline	Alt. 4 – BTC Port	Alt. 5A – Dry Stack Tailings	Alt. 6A – Dalzell Gorge Route
Closure and Reclamation	Fugitive and mobile emissions during reclamation of the pipeline and associated above-ground facilities would occur. Air emissions would not exceed permit thresholds, and impacts would meet regulatory standards.	Similar to Alternative 2	Similar to Alternative 2 but would include reclamation activities for the 18-mile Tyonek diesel pipeline segment and Operations Center and Pumping Facility at Tyonek.	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2
Summary Impact Conclusion	Minor. Air pollutant emissions would not exceed permit thresholds and impacts would meet the regulatory standards.	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2	Similar to Alternative 2

Notes:
* Alternative 1 (No Action Alternative) would have no new impacts to air quality.

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